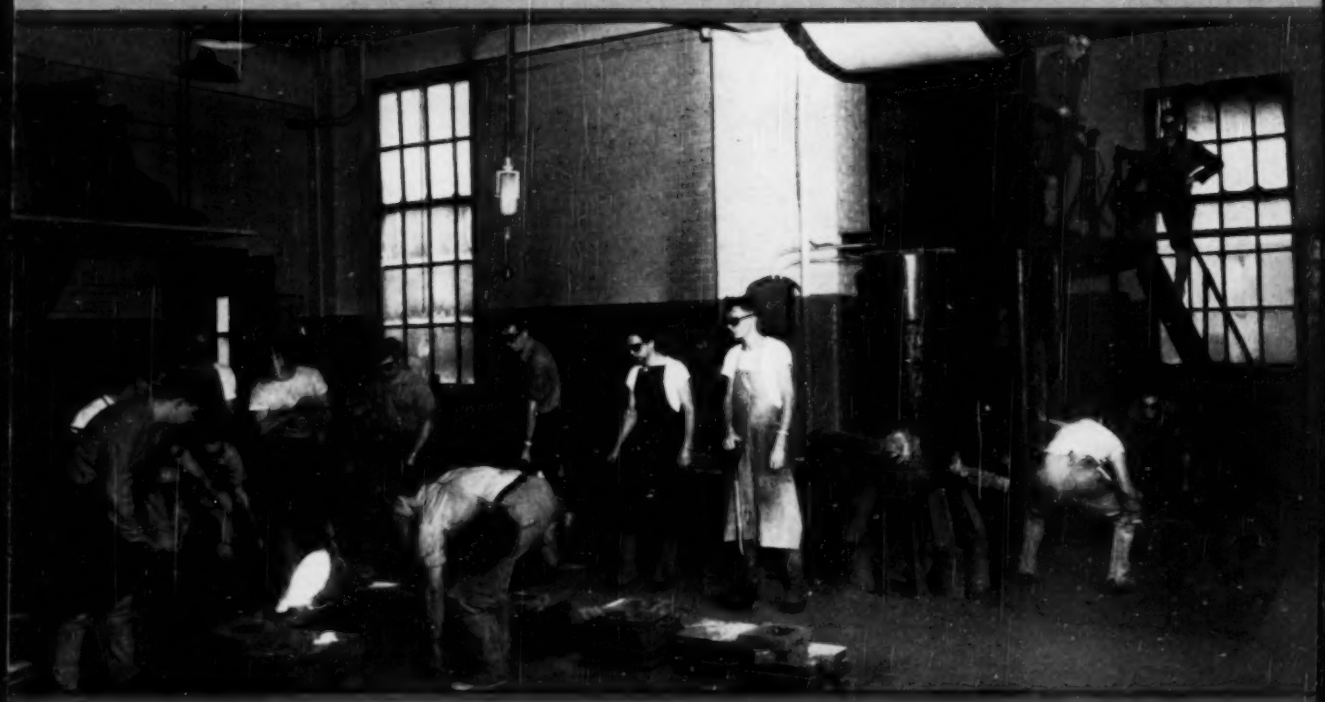
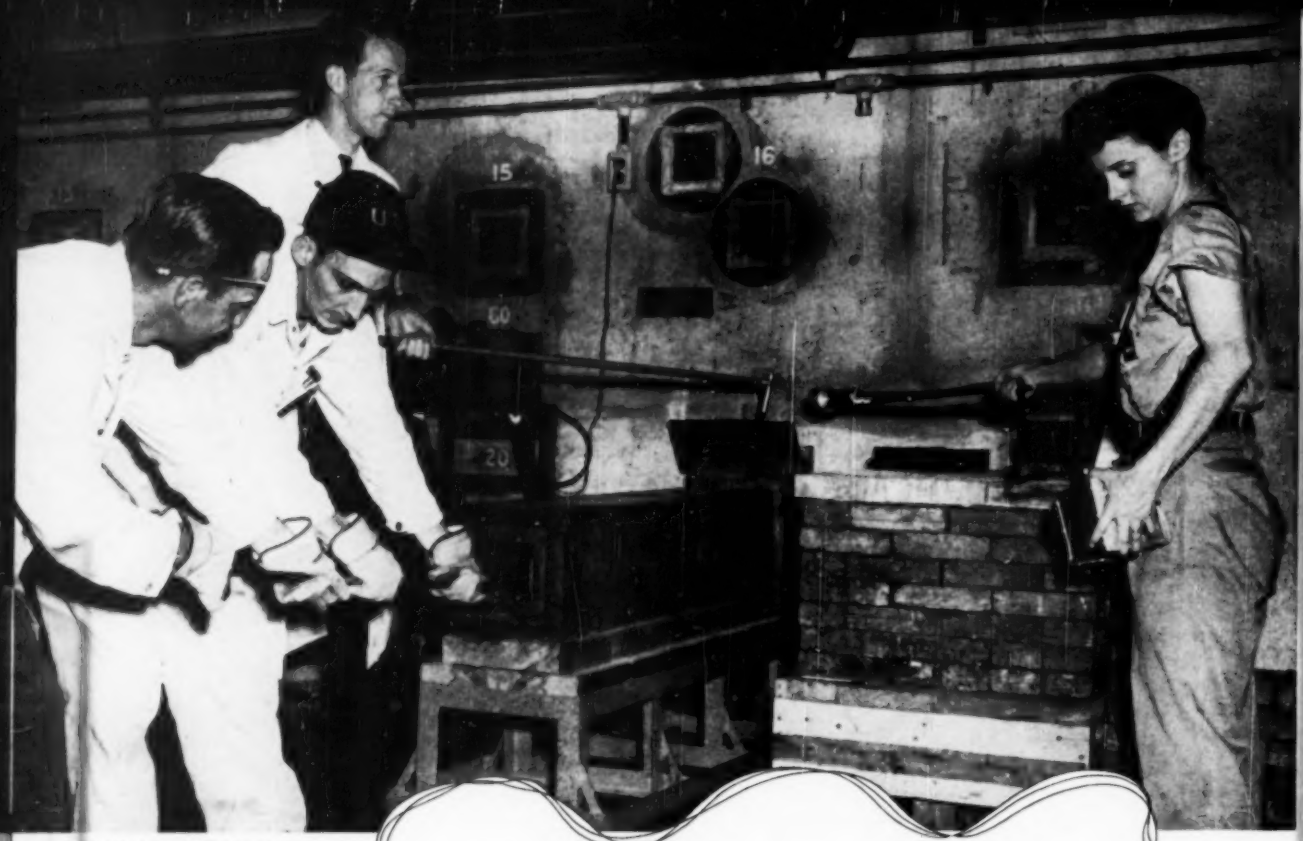
MARCH, 1949 Price, $1.00

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine



SCHOOL SHOP ANNUAL



(Photo by U. S. Army Signal Corps)

they must be handled at a Distance

RADIO-ACTIVE isotopes, structurally unbalanced elements, amazingly useful in medicine, in chemistry and in industry, cannot be handled with impunity. They must be handled at a distance, always with safety-shields between them and the technicians.

Similarly, when it comes to handling the unbalanced material that is boy-in-motion-toward-adulthood, those whose responsibility it is to guide him toward personally happy and socially useful goals, must handle him "at a distance." It is not possible to reach past the barrier of flesh and fashion directly the material of the spirit into will, ambition, desire and enthusiasm. So the wise educator works by subtle precept, by apparently casual example, by inspiration based on the familiar things of school and home. Especially does he employ the desire to emulate which is in every youngster . . . the desire to put *aside* the things of childhood, to put *on* the habiliment of maturity. Every boy wants a "genuine" Babe Ruth bat. Every boy wants to get into long trousers. Every boy wants to drive his dad's car.

When it comes to study and school *work*, just as in recreation and play, the *wise* instructor does *not* battle the current or contradict the urge. Instead, he is on the side of the angels insisting that the tools and instruments that implement the starting efforts be of adult quality, fineness and design. To accept less in drafting instruments, for example, is to say to the youngster—"Stay in the world of childish make-believe. Why try to be a man?" Such thoughtlessness may easily sacrifice one of the great opportunities to kindle ambition in a budding career.

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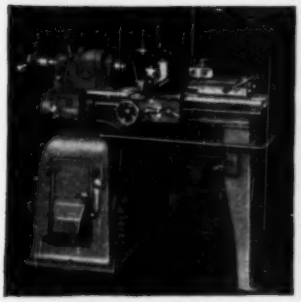
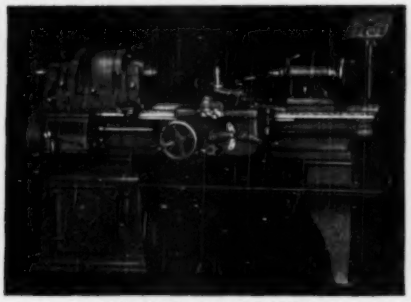
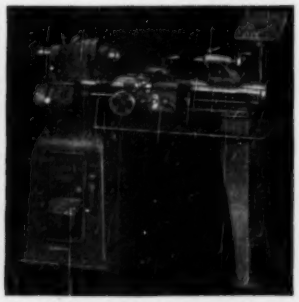


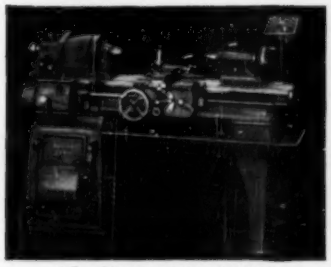
No. 1006-Z Turret Lathe — $1226.00



16" x 6' Toolroom Lathe — $2068.00

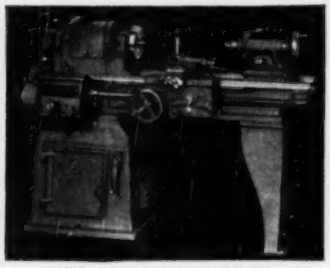


10" x 3½'-1" Col. Cap. Toolroom Lathe — $1196.00



13" x 5' Toolroom Lathe — $1510.00

9" x 3' Model A Bench Lathe — $292.00



14½" x 5' Engine Lathe — $1389.00

All prices f. o. b. factory, less electrical equipment.

14" Bench Drill Press — $98.00

The outstanding records for performance and dependability which South Bend Precision Lathes have achieved under the critical demands of American industry recommend them for student training purposes in the school shop. Performance and dependability, plus ease of control, simplicity of operation, unfailing precision, unusual versatility, and built-in safety features, make South Bend Precision Lathes the logical installations for those school shops where the quality and thoroughness of training are principal considerations. Certainly it is to the students' advantage to learn in school to operate the lathes which they are most likely to use in industry.

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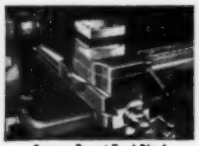

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Double Tool Cross Slide

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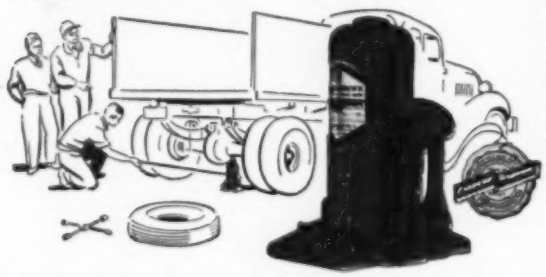

Blackhawk Wrenches teach the value of multi-purpose, quality tools. The line includes tension wrenches. Exclusive Blackhawk NUGGETS save school budgets up to 40% and show students how they will be able to increase their earnings by rate-busting.

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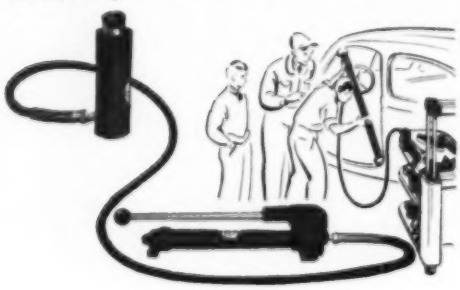

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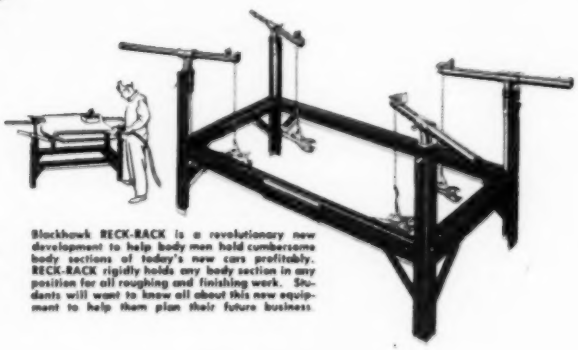
Equipment they will want on the job later

9 out of every 10 of the over 666 million automotive service jobs to be performed in 1949 will require some product as included in the Blackhawk line*. The fact that the type of equipment as offered by Blackhawk is so BASIC means that your students will need it on-the-job later to profitably maintain up-to-date shops. Naturally, you are anxious to keep your students informed on the most modern and accepted shop equipment and to train them to use equipment which will benefit them later in profits and business. That's why we want you to have information on all the latest developments in the Blackhawk Package of essential shop equipment. See your Blackhawk Distributor now or write us!

**From a survey by a leading automotive magazine.*



Blackhawk BECK-RACK is a revolutionary new development to help body men hold cumbersome body sections of today's new cars profitably. BECK-RACK rigidly holds any body section in any position for all roughing and finishing work. Students will want to know all about this new equipment to help them plan their future business.

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To give your students the most modern in shop equipment and to help them become familiar with equipment that will help them do a better job and later earn a better living get this free equipment guide today.

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★ So WELL-BALANCED, operator can control Wrench by holding it *lightly* with one hand.

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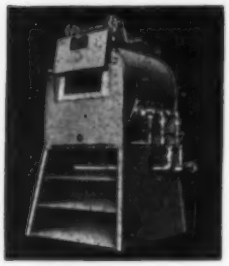

Temperatures from 300°–2400° F. in this new unit

WIDE RANGE OVEN FURNACE

The extreme flexibility of this Sunbeam Stewart semi-muffle gas-fired Oven makes it ideal for general toolroom use. Nozzle-mixing burners give rapid high heat, quick return to low heat. Burners adjustable from a reducing to highly oxidizing atmosphere. The temperature range of 300° to 2400 °F. enables this Sunbeam Stewart unit to be used for a wide variety of work such as annealing carburizing, hardening, preheating, tempering and general heat treating. Sturdy, three-shelf stand keeps tongs, spare parts, work, etc., within easy reach of the operator. Available in the following sizes: 4″x 8″x 12″; 6″x 12″x 18″; and 9″x 15″x 24″ heating space.

Three units on one stand

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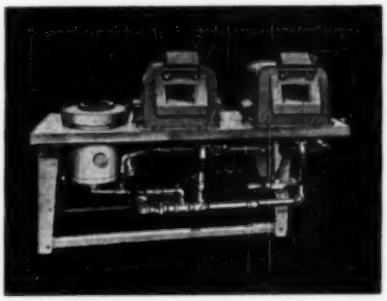
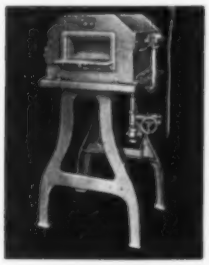
Because of its wide range of usefulness, hte Sunbeam Stewart Triple-purpose Furnace, designed for operation on low pressure gas and air, is a basic metal-working unit for schools. Combines three of Sunbeam Stewart's most popular small furnaces; (1) No. 28 Oven (temperature range 1400° to 1800°), (2) No. 28C Oven (temperature range 1800° to 2400°), (3) B612 Pot Furnace (temperature range 400° to 1600°). Turbo-blower supplies the air required. Because of the precise requirements of today's heat treating, temperature-indicating equipment is recommended. A single pyrometer instrument can be used with a thermocouple selector switch, and a thermocouple with lead wire for each of the three furnace sections.

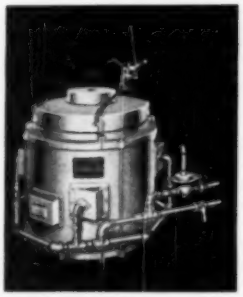




Forging, forming, etc

SMALL FORGES

Where training in modern forge practice is given, these small Sunbeam Stewart Forge Furnaces are standard equipment in many technical schools and colleges. They are ideal for general forging, forming, and tool dressing work. Sturdily constructed and highly efficient in operation with uniform, quick heats. The linings are simple and easily maintained, yet efficient and enduring. Designed for operation on low pressure gas and air.



For the small casting jobs

MELTING FURNACE

These furnaces are designed for the melting of brass, aluminum, tin, nickel alloys, copper, copper alloys, lead, cadmium nickel-silver, bronze, beryllium, antimony, etc. The swinging top, made of one piece of molded refractory, lifts easily, giving a clear opening into the body of the furnace. The linings are of high grade refractory material sufficiently heavy to resist the abrasive action of the swirling flame which the burners set up. Available in crucible capacities from 12, 36 and 105 lbs. of brass up. Gas or oil-fired.

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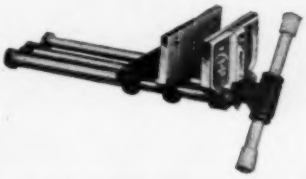

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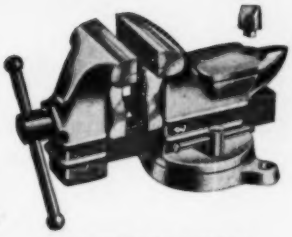
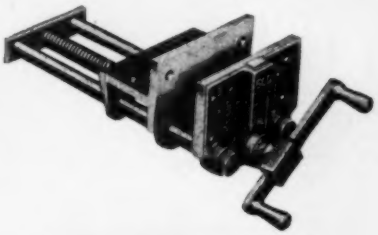
Simple rapid acting mechanism. A slight turn of the handle engages threads of the nut and screw. A half turn tightens the vise to the work. Made in all popular sizes with jaw openings up to 12 inches.



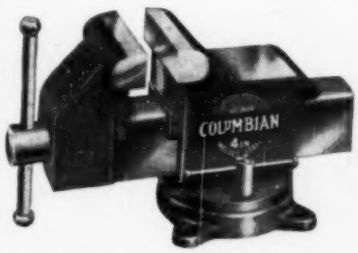
HOMESHOP VISES

Sturdily designed balanced strength and attractive appearance. A complete range of sizes, jaw widths 3", 3½" and 4"; jaw openings 3½", 4", 4½", for home workshop, garage and general use.



WOODWORKERS' VISES

Continuous Screw—Rapid Acting Columbian Woodworkers' Vises are finding increased uses in many plants particularly for the more ordinary types of pattern work. These durable low cost vises are sturdily built with jaw openings up to 12 inches.



"804" STEEL WELDED WORKSHOP VISE

This all purpose vise is all steel fabricated by arc welding. Engineered for strength, accuracy, long life and greatest usefulness. Jaw width – 4 inches; jaw opening – 5 inches; weight – 20 lbs.; finished in bright "Columbian" red.

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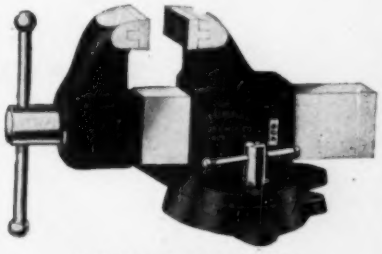
Columbian Malleable Iron HINGED PIPE Vises have self locking unbreakable hooks, tool steel pipe jaws, cold rolled steel screws and handles. Sizes for holding pipe from ⅛" up to 12". Available with long jaws or interlocking jaws.



MACHINISTS' VISES

Columbian Malleable Iron MACHINISTS' VISES are guaranteed unbreakable! In addition to their exceptional strength, Columbian engineering has built into these vises the finest mechanical perfection and special features appreciated by users. Made in all standard sizes – 3" to 8" jaw widths equipped with replaceable tool steel jaw faces.

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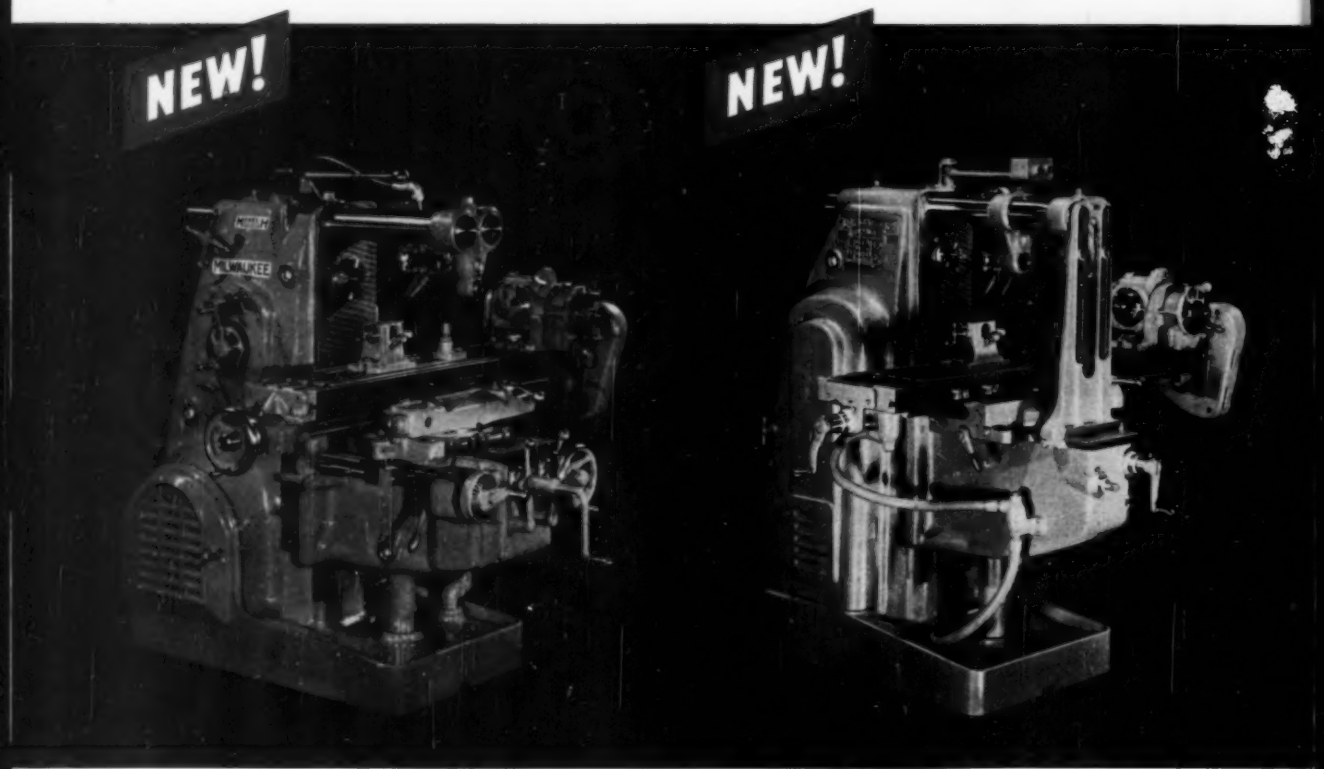
Presenting Modern Milling Machines that Meet Modern Educational Needs

Train Your Students on the Machines they will



Model 2H Universal

IF YOUR vocational classes are to give thorough training in modern milling methods, you'll want a Kearney & Trecker Model 2H Universal milling machine. It provides centralized controls, broad feed and speed and wide working range . . . factors valuable to installations where space is limited and a variety of work must be accomplished. Safety protection includes interlocking controls, spring-actuated dials, totally enclosed motor and wiring. That means students get instruction under safest possible conditions. Write for catalog No. H20.

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YOU'LL FIND that these new Kearney & Trecker Models 2E Plain and Universal knee milling machines are literally custom-built to meet your educational training needs. That's because their design was based upon an extensive two-year study of milling machine requirements we made recently in all types of domestic and foreign industry. You will readily see that the new Models 2E Plain and Universal milling machines completely satisfy every fundamental requirement for an up-to-the-minute vocational training tool. Write for Bulletin No. E-10-A.

Because of the rapid improvement of cutting materials,cutting tools and machine designs, progressive schools are now replacing worn-out and obsolete equipment with modern milling machines. These Kearney & Trecker Milwaukee Milling Machines give you every feature of modern milling machine design usually found only on larger-size machines. This fact alone has proven of exceptional value in all phases of vocational instruction — and in particular in the most advanced stages of applying modern milling practices. They are low in height and occupy a minimum floor space. Kearney & Trecker Corporation, 6784 West National Avenue, Milwaukee 14, Wisconsin.

Today ... use Tomorrow

Model 2HL Universal

YOU'RE LOOKING at one of the most popular machines we have ever built for general shop and vocational training purposes—the Model 2HL Universal. This machine features simplified operation with convenient directional controls. It has all the big machine features found on all Kearney & Trecker-Milwaukee milling machines—Solid Back Column, Cross Mounted Motor, Multiple V-Belt Drive, Double Overarms, Automatic Flood Lubrication, "Live" Rapid Traverse and complete Safety Control Interlocks. Write for descriptive Bulletin H13-A.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Get these helpful training books — Book One — "Right and Wrong in Milling Practise" and Book Two — "The Milling Machine and Its Attachments" PRICE: 25 Cents each.

Here are a Few of the Schools Now Using Kearney & Trecker Milwaukee Milling Machines for Vocational Training

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University of California — Berkeley
Compton Union High School — Compton
University of California — Davis
Fullerton Union High School — Fullerton
Whittier Union High School — Los Angeles
Board of Education — San Francisco
Santa Ana High School — Santa Ana

COLORADO
School District No. 20 — Pueblo

CONNECTICUT
State Trade School - Stamford

ILLINOIS
State Teachers College — Charleston
University of Chicago — Chicago
Englewood High School — Chicago
Washburne App. School — Chicago
Joliet Township High School — Joliet
Moline Board of Education — Moline
Bradley Polytechnic Institute — Peoria
Rockford Senior High School — Rockford
Sterling Tp. High School — Sterling
University of Illinois - Urbana

INDIANA
Alex. Jr.-Sr. High School — Alexandria
Washington High School — East Chicago
Arsenal Tech. High School — Indianapolis
Purdue University - Lafayette — Vocational Education Dept.
Gerstmeyer Tech. High School — South Bend
Indiana State Normal — Terre Haute

IOWA
Iowa State College - Ames
Davenport Public Schools — Davenport

KANSAS
Labette Co. Com. High School — Altamont
Kansas State Agric. College — Manhattan
Topeka Public Schools — Topeka
Wichita High School — Wichita

KENTUCKY
Theo. Ahrens Trade School — Louisville

MASSACHUSETTS
Beverly High School - Beverly
Brookline Manual Training — Brookline
Mass. Institute of Technology — Cambridge
East Boston High School — East Boston
Holyoke High School — Holyoke
Hyde Park High School — Hyde Park
Lawrence Industrial School — Lawrence
Medford Vocational School — Medford
Vocational School — New Bedford

MICHIGAN
University of Michigan — Ann Arbor
Dearborn High School — Dearborn
Fordson School - Dearborn
Lowrie Jr. High School — Dearborn
Salona Jr. High School — East Dearborn
Cass Technical High School — Detroit
Chadsey High School — Detroit
Bishop School - - Detroit
Edwin Denby High School — Detroit
Wright School - - Detroit
Redford High School - Detroit
G-M Institute of Technology — Flint
Ottawa Hills School — Grand Rapids
Harrison Park School — Grand Rapids
Union High School — Grand Rapids
Copernicus Jr. High School — Hamtramck
Hamtramck Voca. School — Hamtramck
Jackson High School — Jackson
Central High School — Kalamazoo
Western State Teachers Col. — Kalamazoo
Boys Vocational School — Lansing
Michigan State College — East Lansing
Wilson School - Muskegon

MINNESOTA
School District No. 12 - Ely

MISSOURI
Manual High & Voca. High — Kansas City
Cleveland High School — St. Louis

NEW HAMPSHIRE
N. H. College of Agriculture — Durham
University of New Hampshire — Durham
West Side High School — Manchester

NEW JERSEY
Boys Vocational School — Bloomfield
Central High School — Trenton
Rutgers University — New Brunswick

NEW YORK
New Technical High School — Auburn
Union Free School District — Batavia
North Senior High School — Binghamton
Peckham Vocational School — Buffalo
McKinley Vocational School — Buffalo
Vocational School No. 10 — Dunkirk
Board of Education — Hastings upon Hudson
State Agricultural School — Industry
Jamaica Continuation School — Jamaica, L. I.
Newton High School — Long Island City
Masena High School - Masena
Textile High School — New York
Queens College - New York
Auburn High School — New York
Bronx Vocational School — New York
Franklin K. Lane High School — New York
Geo. Hall Trade School — Ogdensburg
University of Rochester — Rochester
Rochester Shop School — Rochester
Saranac Lake Public School — Saranac Lake
Staten Island Voca. School — Staten Island
Continuation School — Syracuse

LOUISIANA
Sullivan Mem. Trade School — New Orleans

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University of N. C. — Chapel Hill
Duke University - Durham

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Timken Foundation of Canton — Canton
East Technical High School — Cleveland
West Technical High School — Cleveland
Collinwood High School — Cleveland
Case School of App. Science — Cleveland
Cuyahoga Heights School — Cuyahoga
Perkins Observatory — Delaware
Washington High School — Massillon
Toledo Vocational School — Toledo
Woodward High School — Toledo
Waite High School - Toledo

OKLAHOMA
University of Oklahoma — Norman
Board of Education — Ponca City
Daniel Webster High School — Tulsa
New High School - Tulsa

OREGON
Jefferson High School — Portland

PENNSYLVANIA
Allentown High School — Allentown
Lower Merion High School — Ardmore
Bethlehem Trade School — Bethlehem
Liberty High School — Bethlehem
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Vocational Machine Shop — Clairton
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Ridley Township High School — Folsom
Franklin High School — Franklin
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Wilmerding School District — Wilmerding

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VIRGINIA
John Marshall High School — Richmond

WEST VIRGINIA
Stonewall Jackson High School — Charleston
Huntington High School — Huntington
West Virginia University — Morgantown

WASHINGTON
Seattle-Edison Voca. School — Seattle

WISCONSIN
Beloit Vocational School — Beloit
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Green Bay Vocational School — Green Bay
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Kenosha Vocational School — Kenosha
West High School - Madison
Madison Vocational School — Madison
Marinette Vocational School — Marinette
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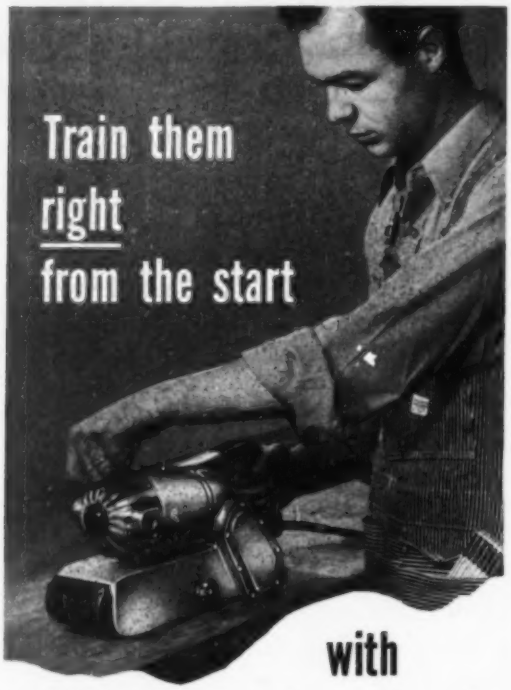

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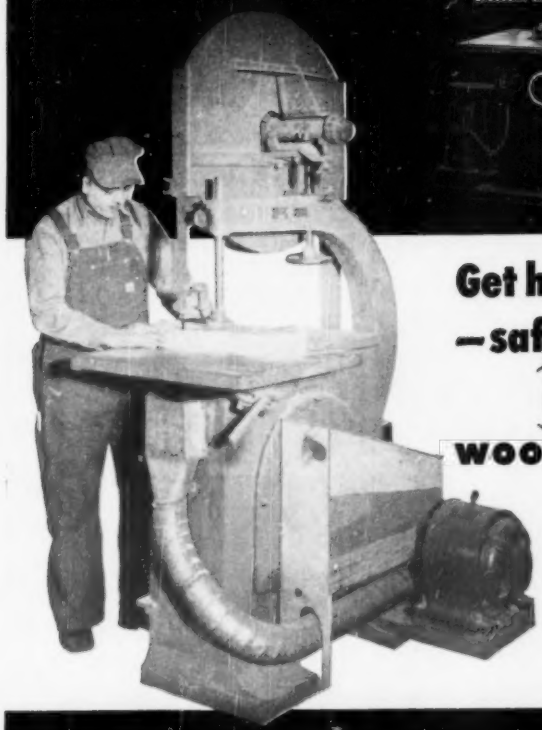

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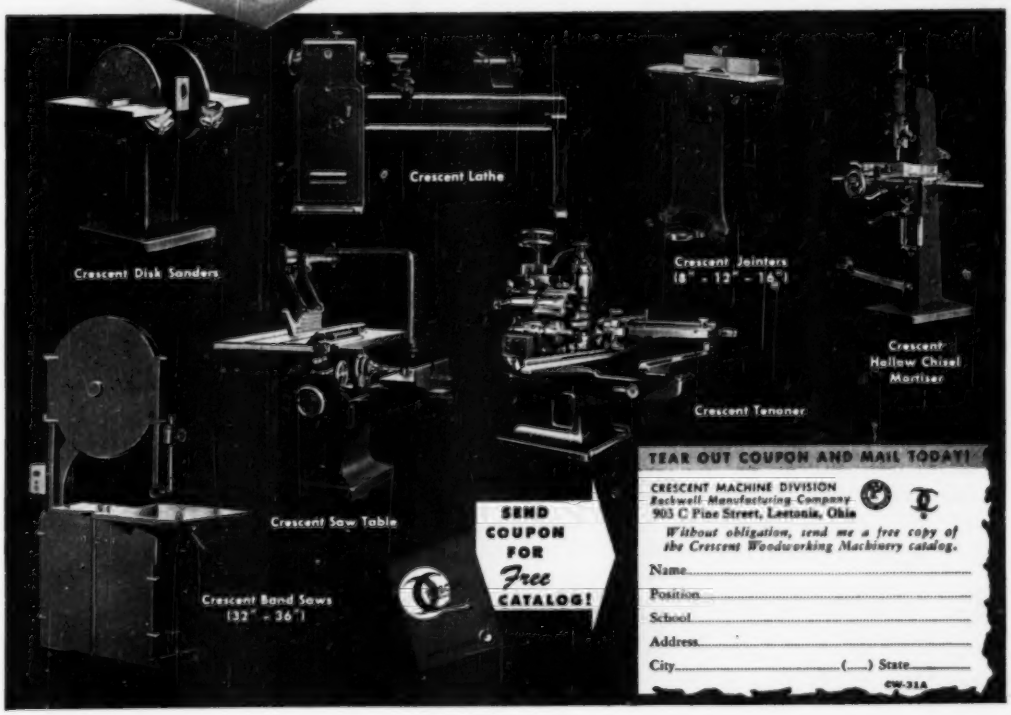
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- Keep files in a dry place, so rust will not corrode their cutting edges.
- Keep files clean of filings. Tap file frequently on wood (not on metal) to loosen chips. Also brush with file brush or "card."
- Don't put too much pressure on the forward, or cutting, stroke.
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The 1949 School Shop Annual

This number of the SCHOOL SHOP ANNUAL again presents to the reader useful articles on school-shop planning, some shop courses, an interesting account of industrial-arts work in Canada, and some problems and projects.

Those who are at present involved in school-shop planning should not fail to read the articles by Chris H. Groneman, George A. Willoughby, Thomas A. Hippaka, DeWitt Hunt, and E. R. Glazener.

George A. Soderberg's article titled "Color Rendering" contains excellent material for those planning the decoration of new or old shops.

Among the articles on shop courses are several that are quite noteworthy. Those interested in woodwork (carpentry), plumbing and steam fitting, drafting, metalwork, and aviation are advised to look over this section very carefully.

This Month's Cover

The cover for the March School Shop Annual number portrays a foundry class at the Indiana State Teachers College, Terre Haute, Ind. The picture was taken in the fall of 1948. Arthur H. Luehring is the instructor, and the photograph was sent to us by Sylvan A. Yager, chairman of industrial arts and trades and industries at the college.

Coming Conventions

Mar. 3–5. American Society of Training Directors, at Cleveland, Ohio. Headquarters, Hotel Carter. Secretary, Hugh Booth, Y.M.C.A., Detroit, Mich.

Mar. 17–19. New Jersey Vocational and Arts Association, at Asbury Park, N. J. Headquarters, Carteret Hotel. Chairman, Holmes A. Oliver, 144 Ashland Road, Summit, N. J.

Mar. 23–26. Western Arts Association, at Dallas, Tex. Headquarters, Adolphus Hotel. Convention manager, Harold W. Hunsicker, 1649 Elberon Ave., East Cleveland 12, Ohio.

Mar. 24–27. Illinois Vocational Association, and Illinois Industrial Association, at Peoria, Ill. Headquarters, Hotel Pere Marquette. Secretary, W. P. Klingensmith, 228 N. LaSalle St., Chicago 1, Ill.

Mar 25–26. California Industrial Education Association, at San Diego, Calif. Headquarters, 203B San Diego Vocational School, 835 — 12th Ave. Convention chairman, Wm. B. Steinberg, San Diego, Calif.

Apr. 6–9. Eastern Arts Association, at Boston, Mass. Headquarters, Statler Hotel. Convention manager, Vincent A. Roy, 215 Ryerson St., Brooklyn 5, N. Y.

Apr. 14–16. Southeastern Arts Association, at Richmond, Va. Headquarters, John Marshall Hotel. Secretary, Miss Ruth Harris, 111 W. 11th Ave., Johnson City, Tenn.

Apr. 14–16. Texas Vocational Association, at San Antonio, Tex. Headquarters, Plaza Hotel. Convention chairman, E. Esten Day, P.O. Box 1319, Lubbock, Tex.

National Society for Crippled Children and Adults, 11 So. LaSalle St., Chicago 3, Ill.

VOL. 38, NO. 3 MARCH, 1949

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

THE BRUCE PUBLISHING COMPANY
540 NO. MILWAUKEE ST., MILWAUKEE 1, WIS.

CENTRAL OFFICE: 20 N. WACKER DRIVE, CHICAGO 6, ILL.
EASTERN OFFICE: 330 WEST 42ND ST., NEW YORK 18, N.Y.

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Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879.

Copyright, 1949, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930.

Published monthly except during July and August.

Subscription Information. — Subscription price in the United States, Canada, and countries of the Pan-American Union, $3.00 per year, payable in advance. Postage, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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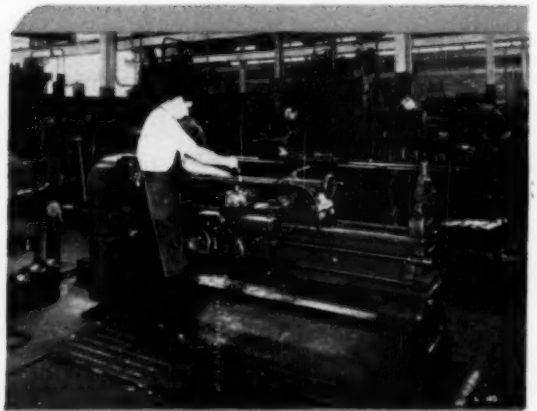

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MARCH . . . 1949

Industrial Education at the Agricultural and Mechanical College of Texas

CHRIS H. GRONEMAN
Acting Head, Industrial Education Department
Agricultural and Mechanical College of Texas
College Station, Tex.

Industrial education at the Agricultural and Mechanical College of Texas, College Station, is administered through a separate department of industrial education within the School of Engineering. By virtue of its place in the school of engineering, the department has access to the specialists, shops, laboratories, and library of this large agricultural and technical institution.

Even though the total square foot area available for instruction to students in industrial education is now approximately 32,000 square feet, it is very probable that this will be expanded appreciably within a short time due to a definite building program.

The accompanying photographs and floor layout plans show the extent of the facilities.

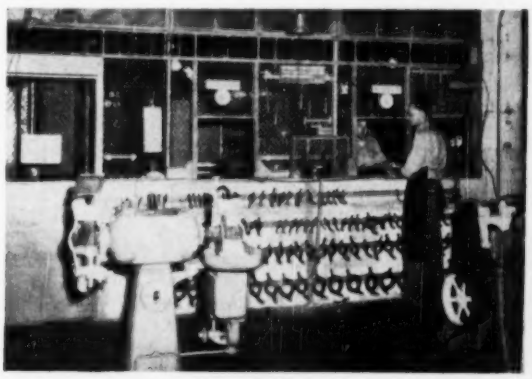
This school, the largest all-male college in the world, is situated approximately 150 miles from the Gulf of Mexico region of Texas. It forms the center of a triangular geographical area whose points are Houston, Dallas, and San Antonio; all large and vigorously growing cities of Texas.

In addition to its many other traditions, Texas A. & M. College is proud of the fact that it has supplied more commissioned officers for the armed forces in both world wars than any other military institution.

This College was founded for the teaching of agriculture and mechanic arts as the result of the Morrill Act. The institution has experienced a steady growth until today it has an enrollment of nearly 9000 men. The department of industrial education was created shortly after the passage of the Smith-Hughes Act for the purpose of training vocational-industrial teachers. During the late 1920's the industrial-arts movement began its expansion in the Southwest necessitating the inclusion of another curriculum in the industrial-education department specifically for the training of industrial-arts teachers.

Until recently the department has maintained a staff of itinerant vocational-industrial teacher trainers, as well as the resident staff. The itinerant vocational-industrial teacher-trainers operate in cooperation with the trade and industrial division of the Texas State Board for Vocational Education. During the years of National Defense Training prior to the recent war, public-service occupations instructors were added to the departmental staff as a phase of the extension or off-campus activities. More recently the extension program, including vocational-industrial teacher trainers, has become so far reaching through the addition of greater services and more teachers that it is now a separate division of the college, known as the industrial extension service, and is responsible for all off-campus activities pertaining to industrial teacher training and training for the industries and public service occupations.

Theory and practice are incorporated in this modern foundry



Industrial-type toolroom in the machine shop

Bench and machine woodwork shops

1. Belt sander
2. Disk and spindle sander
3. Jig saw
4. Workbench
5. Supply cabinet
6. Table saw
7. Disk sander
8. Drum sander
9. Production shaper
10. Veneer squaring shears
11. Jointer
12. Mortiser
13. Surfacer planer
14. Surfacer outfeed table
15. Woodturning lathe
16. Radial saw
17. Band saw
18. Saw sharpening bench
19. Lumber rack
20. Bench grinder
21. All-purpose grinder
22. Drill press
23. Arbor press
24. Miter box
25. Dumore Carvit
26. Veneer trimmer
27. Air compressor
28. Finishing table
29. Supply cabinet
30. Finishing cabinet
31. Exhaust fan

Curriculums

The function of the industrial-education department now is residence teaching. It provides instruction on a college level in the field of industrial education. The two curriculums administered by the department are known as Groups 1 and 2.

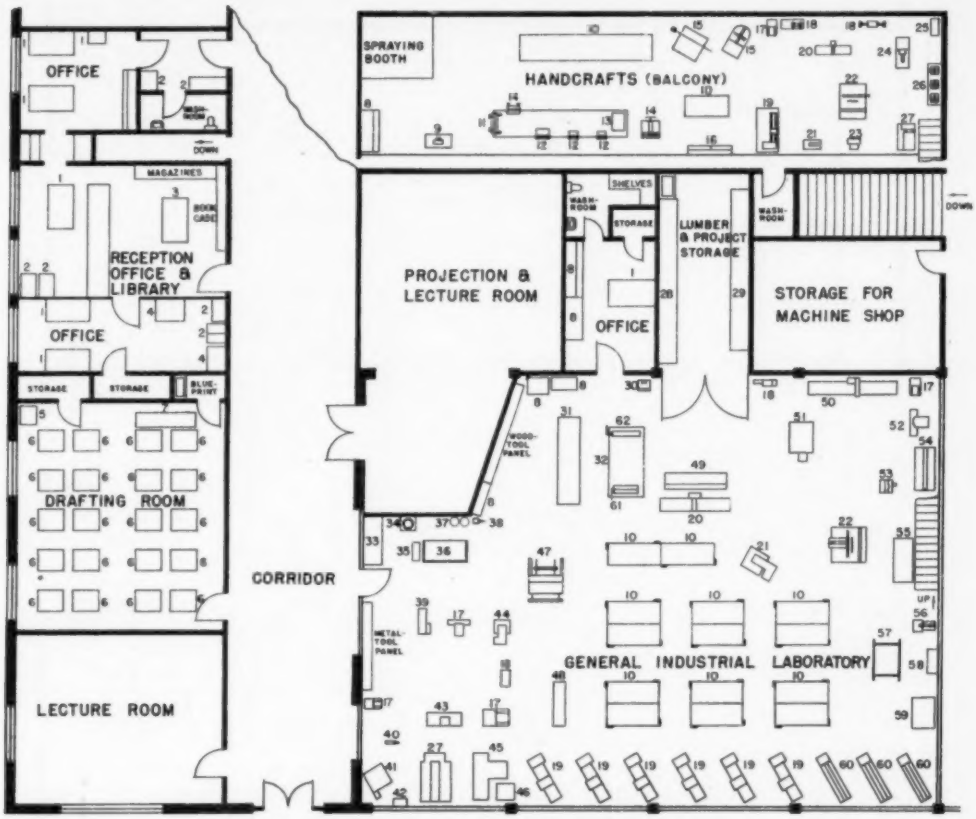
Group 1 is exclusively for the training of prospective industrial-arts teachers and personnel for employment in industry. Graduates of the Group 1 plan, interested in teaching industrial arts, are sought by administrators of public schools, including elementary and secondary education, junior colleges, senior colleges, vocational schools, and technical institutions as teachers and supervisors of shop and laboratory courses in drafting, woods, metals, electricity, plastics, leather, bookbinding, photography, and other allied handcrafts, and in the fields of guidance and driver education. Many successful teachers are engaged in the terminal type programs of the junior colleges. Those who are employed in senior colleges are generally engaged in teacher-training and in shop activity courses for the training of engineers.

Group 2 is designed to educate prospective teachers for the vocational-industrial teaching field. Those completing the curriculum for vocational-industrial teachers, often referred to as trades and industries, are engaged as teachers, co-ordinators, supervisors, and directors of vocational-industrial programs for the senior high schools, and industrial terminal programs of junior colleges, vocational schools, and technical institutes; and a gratifying number are employed in responsible positions by State Departments of Education through their vocational-education divisions.

Since it appears that the curricula in the two groups are designed to serve mainly the teaching fields, it should be pointed out that approximately 50 per cent of those who graduate from these two areas enter industrial employment. Due to their professional education in the field of general industries, graduates of this department are in demand and are interviewed by representatives of industry as consultants and supervisors in departments of safety, personnel, production, and education and training of the rapidly expanding industrial empire of the Southwest.

Departmental Facilities

The industrial-education offices, library,



General industrial laboratory, drafting room, and offices

1. Desk
2. Filing cabinet
3. Study table
4. Duplicating machine
5. Instrument cabinet
6. Drafting table
7. Instructor's table
8. Supply cabinet
9. Embossing machine
10. Workbench
11. Book trimmer
12. Sewing clamp
13. Plastics oven
14. Backing clamp
15. Paper and book shears
16. Craft-tool panel
17. Drill press
18. Bench grinder buffer
19. Engine lathe
20. Jointer
21. Band saw
22. Table saw
23. Disk sander
24. Sewing machine
25. Electroplating unit
26. Book press
27. Metal shaper
28. Project rack
29. Lumber rack
30. Wood tool grinder
31. Soldering bench and furnaces
32. Sheet-metal-layout bench
33. Foundry table
34. Non-ferrous furnace
35. Arc welder
36. Welding table
37. Oxygen-acetylene cylinders
38. Spot welder
39. Power hack saw
40. Anvil
41. Forge
42. Coke bin
43. Surface grinder
44. Metal-cutting band saw
45. Universal milling machine
46. Lathe-tool cabinet
47. Squaring shears
48. Cornice brake

and student reading center are located in the mechanical engineering shops building. The reception office and library room is conveniently situated off the main corridor for the convenience of students, teachers, and visitors. Offices adjacent to it are for the department head and some of the staff.

In this building are also drafting rooms, industrial shops and laboratories, projection and lecture rooms, and the mechanical engineering shops which serve as instructional centers for the industrial-education students. Closely allied courses in engineering drawing, architecture, agricultural engineering farm shop, and photography are centered in other buildings on the main campus.

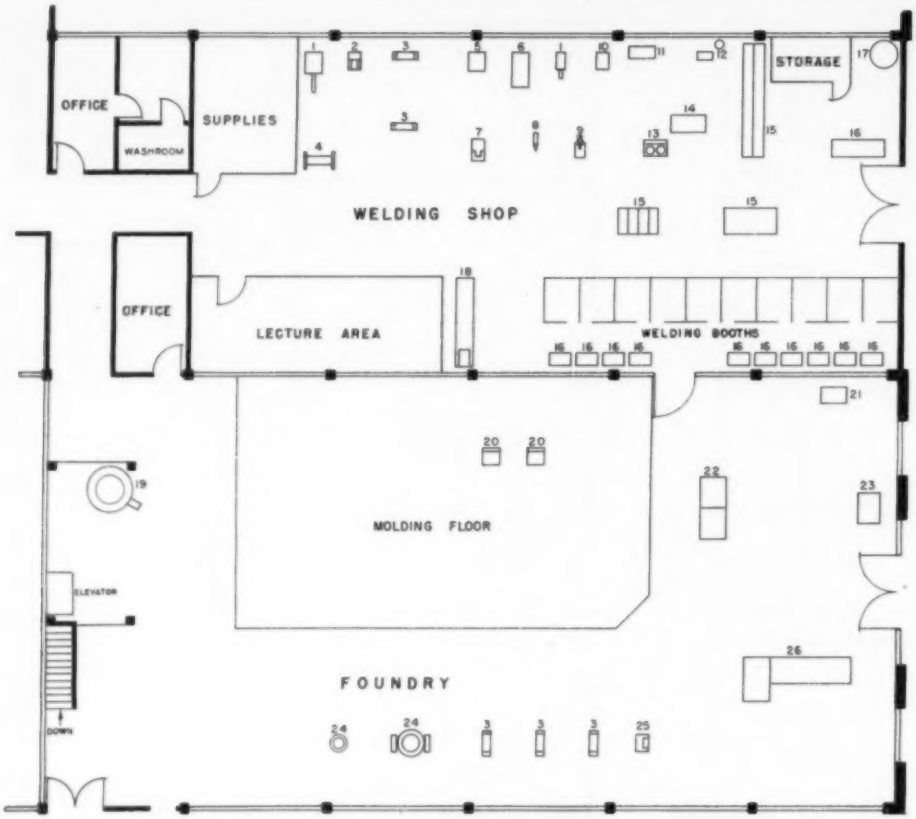
The latest in modern equipment is used in all departmental and co-operating departmental shops and laboratories.

The general industrial laboratory is maintained and operated by the industrial-education department exclusively for use by its students. There are approximately 5100 square feet of floor space in this area. It is so arranged in flexibility that two courses may be taught simultaneously. There is a balcony space which provides for teaching the handcrafts of bookbinding, plastics, leather, and art metal.

The main floor space of this laboratory or shop is arranged to accommodate instruction in courses of woodworking, sheet metal, ornamental iron, electricity, advanced metalwork, and the general shop. In addition, there is space for storage of materials and unfinished projects. An office and lavatory are adjacent for the convenience of teachers and students.

A lecture room across the corridor from the general industrial laboratory is used for theory and related instruction for shop and laboratory courses.

The drafting room between the lecture room and the main office is adequately

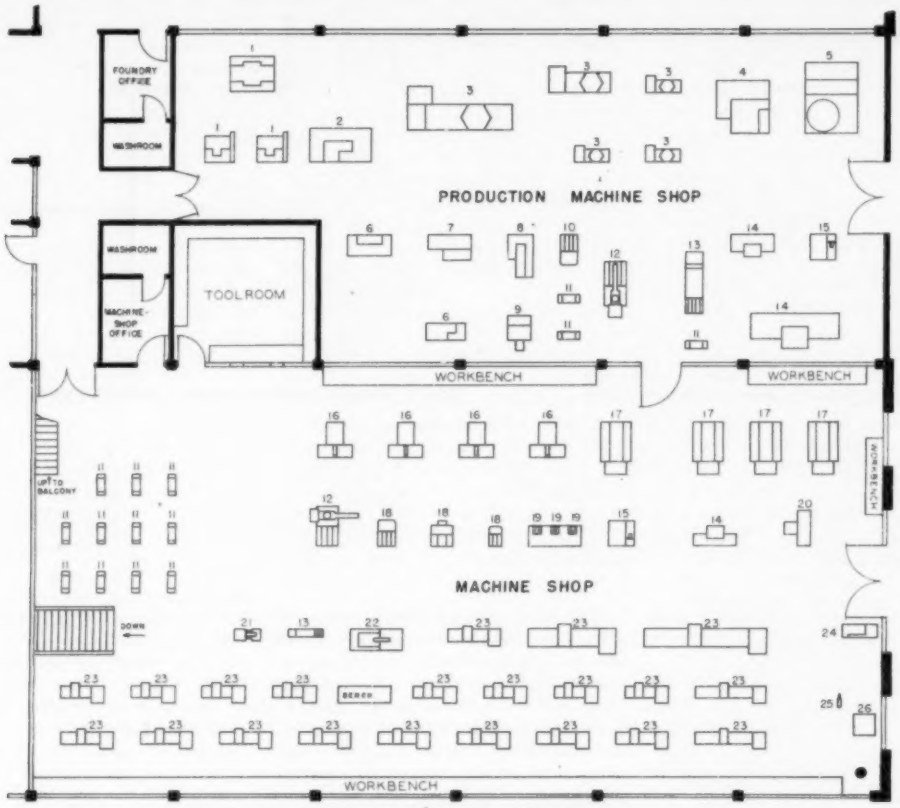


Foundry and welding shops

1. Spot welder
2. Upright drill
3. Tool grinder
4. Hydraulic press
5. Transformer for automatic arc welder
6. Automatic arc welder
7. Hardness tester
8. Anvil
9. Machinist's vise
10. Atomic hydrogen welder
11. Supply cabinet
12. Heliarc welder
13. Oxygen-acetylene cylinders
14. Work table
15. Oxy-acetylene welding table
16. Portable arc welder
17. Acetylene generator
18. Magna-flux tester
19. Cupola
20. Pneumatic rammer
21. Heat-treating furnace
22. Sand-mixing box
23. Core and mold oven
24. Non-ferrous furnace
25. Grinder
26. Sand table

General industrial laboratory planned for metal, wood, and electricity

Facilities in the welding shop



Machine and production machine shops

1. Punch press
2. Screw machine
3. Turret lathe
4. Gear generator
5. Vertical turret lathe
6. Threading machine
7. Production milling machine
8. DoAll machine
9. Broaching machine
10. Tapping machine
11. Bench grinder
12. Radial drill
13. Centering machine
14. Surface grinder
15. Monoset grinder
16. Universal milling machine
17. Metal shaper
18. Upright drill
19. Drill press
20. Universal tool grinder
21. Arbor press
22. Metal-cutting band saw
23. Engine lathe
24. Power hack saw
25. Anvil
26. Gas forge

equipped and lighted fluorescently for the efficient instruction of methods courses in the teaching of drawing. The location of this room makes it serviceable for related drafting to the skill courses.

Co-operating Departmental Facilities

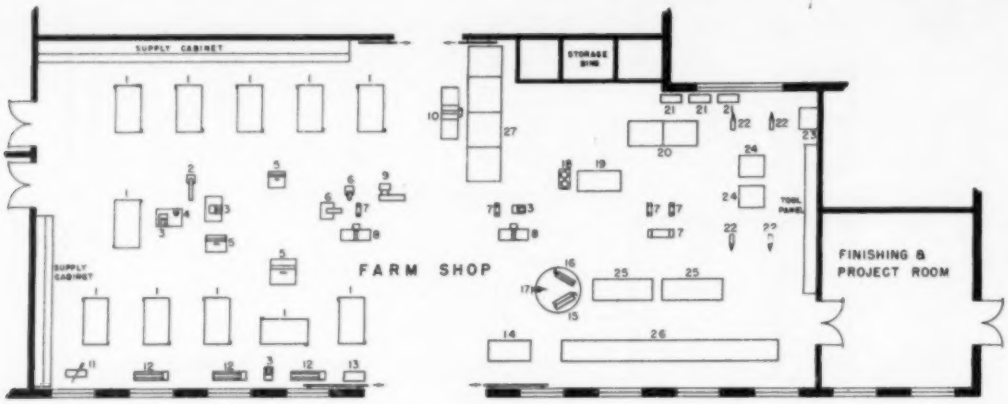
The several co-operating departments within the institution are mechanical engineering, which offers courses in patternmaking, woodworking, cabinetmaking, welding, foundry, and machine shop; engineering drawing, where students obtain instruction in the several courses of freehand, engineering, and machine drawing, industrial reproduction, and descriptive geometry; architecture, where special courses are set up exclusively for industrial students in planning, drawing, and the study of architecture necessary for the teaching of similar courses in the public schools; agricultural engineering, offering courses in farm shop for students of industrial and agricultural education; and physics, which has recently added the newest course in modern photography.

Most of these departments have additional courses which serve as excellent electives.

It is interesting to note that many of the instructors within these co-operating departments either have studied industrial education, or have professional degrees in this field, hence they are very sympathetic to the objectives of this work. In addition they have had many years successful, practical experience in their respective trades.

Patternmaking, machine tool woodworking, cabinetmaking, equipment maintenance, and wood finishing courses are taught in an area of approximately 9600 square feet. This area is divided into spaces for bench and machine woodwork, with an ideal arrangement of rooms for tools, finishing, projection, drying, veneering, and storage. There is a kiln for drying wood located in the drying and veneering room. Much of the wood used in woodworking courses is purchased green so that students may have the opportunity to learn how to kiln-dry their lumber before planning and making their projects.

Students in these shops learn the elements involved in making patterns for casting in the foundry. Many go through the complete process of making a pattern, casting it, and then machining the final project. The projects built in the woods courses are based upon operations and related information. Much interesting and beautiful mar-



Farm shop

1. Double workbench
2. Jig saw
3. Drill press
4. Disk sander
5. Table saw
6. Band saw
7. Tool grinder
8. Jointer
9. Disk and belt sander
10. Surfacer planer
11. Miter box
12. Wood lathe
13. Tool-sharpening table
14. Desk and first-aid station
15. Bar folder
16. Forming rolls
17. Machinist's vise
18. Oxygen-acetylene cylinders
19. Acetylene-welding table
20. Arc-welding area
21. Portable arc welder
22. Anvil
23. Coal bin
24. Forge
25. Metal workbench
26. Sheet-metal-layout bench
27. Lumber rack

quetry, veneering and cabinetwork, comparable and often surpassing the products of industry, are produced here.

The machine shops, consisting of approximately 7600 square feet floor space, are divided into instruction in elementary machine-shop processes, and an area devoted to the observation of methods employed in the operation of precision type production machines. Industrial education students, along with engineering students, are taught the basic principles in these fields. Each industrial education student is required to make those projects which will provide for him an opportunity to work on each type of bench and power machine. Exercises are dispensed with and all practices are directed toward usable objects, the final one being a bench-type drill press. The castings for the numerous projects involving cast iron parts are produced by students in the foundry.

The machine shop employs a toolroom system with an employed toolroom man, very much along the pattern used in industry. The production machine shop was established and built during the past few years to give students an opportunity to observe high precision production machinery in operation. This is especially beneficial to those who later wish to enter industrial employment.

The machine shops, foundry, and welding shops are in the same building with the industrial-education department, thus making them conveniently accessible to students.

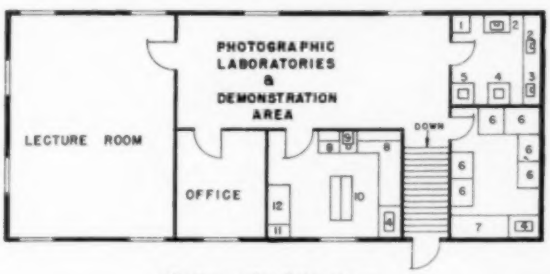
The foundry, which has approximately 4300 square feet of floor space, has facilities for casting aluminum, brass, and cast iron. Students learn the industrial processes of foundry work in this area. The numerous castings required in metal courses are made here. Students frequently design, plan, and make some very elaborate plaques from brass and aluminum, along with the other required and elective projects.

The welding shop of an approximate 3500 square foot floor space is adjacent to the foundry. Several types of welding are taught. Electric arc welding is done in individual safety-type booths with an overhead exhaust system to carry out fumes. Oxyacetylene welding and cutting is adequately provided for in the other portion of the shop. Many varieties of testing equipment are set up to test welds and joints.

Instruction in welding concerns itself with elementary exercises to acquire basic skills, after which the students are permitted to fabricate metal projects with the use of the techniques learned.

The welding lecture area, partitioned within the welding shop, has provision for projection of visual aids. Supply and storage rooms are of the conventional type for the purposes intended.

The farm shop, located in a modern near-by building, has an approximate floor space of 3800 square feet. Industrial-edu-



Photography laboratory

1. Table
2. Enlarger 4 by 5-in.
3. Enlarger 2¼ by 3¼-in.
4. Sink
5. Sink and storage cabinet
6. Curtain enclosed film loading booth
7. Cabinet and work table
8. Cabinet
9. Dry mounting press
10. Storage shelves
11. Film cabinet
12. Drying table

cation students may, and many do, elect to take courses in farm shop, especially if they definitely plan to teach industrial subjects in rural areas. Taught in this shop are carpentry, bench metal, sheet metal, forging, welding, concrete, heavy leather, ropemaking, and other allied farm-type activities.

The newest elective subject available for industrial-education students is photography. Approximately 1500 square feet of floor space is allocated to this division by the physics department. Much new photographic equipment has been purchased, and additional pieces of equipment have been installed to make this one of the most complete and modern photographic studios for the teaching of photography.

This is a laboratory type course wherein students obtain instruction in, and have an opportunity to perform, processes in the latest developments in this highly interesting field. It is rapidly proving to be a very popular and useful course.

General Physical Aspects

Students coming in contact with the various drafting rooms, shops, and laboratories of the industrial-education department and the co-operating departments have an opportunity to observe the industrial types of buildings with respect to floors, lights, heat, ventilation, and tool storage arrangements. The floors are of different materials and construction, being edge grain wood, end grain wood blocks set in sand, and the more common concrete type. An area in the foundry is earthen.

Practically all of the shops and laboratories have been designed to obtain the maximum natural lighting and ventilation. Space is provided in the upper portions of most shops for the release of hot air through windows, exhaust fans, and ventilators. The natural lighting is supplemented by artificial incandescent and fluorescent fixtures. Heat, when needed, is furnished from a central campus heating plant, through radiators.

The interior painting of the shop, laboratory, and lecture room walls, equipment and fixtures conforms to scientific data recently developed by leading paint companies. The color scheme followed is known as the dynamic color scheme. The general appearance is particularly attractive to students, instructors, and visitors, and has increased the general morale of all who study and work in these surroundings. A most hearty approval has been given to this arrangement by representatives of industry and education.

Student Organizations

The department of industrial education is sponsor for two student organizations: the Industrial Education Club, and The A. & M. Aerocrats. The first is a professional type club for those majoring in the department; elected student officers arrange programs and other functions of the club which meets semimonthly. Campus and off-campus speakers are invited to discuss educational and timely industrial problems. Certain school-approved social activities are also conducted for, and by, this group of students.

The A. & M. Aerocrats is a club open in membership to any student of the college who is interested in the development and promotion of model aeronautics. There is a faculty sponsor for each club.

Degrees, Certification, and Graduate Program

Students who satisfactorily complete the industrial-education curriculum, Groups 1 or 2, receive a bachelor of science degree in industrial education which is based upon 144 semester hours of college work. Elective courses are provided under each plan and are subject to the approval of the department head.

Students who pursue certain of the elective courses may obtain a certificate in driver education. This is a special requirement by many schools.

All graduates are qualified to apply for a state lifetime teaching certificate to teach industrial subjects. Many graduating under the Group 2 plan possess the qualifications to obtain certain certificates for the teaching of vocational-industrial courses.

A summer residence program for the professional upgrading of employed vocational-industrial teachers is conducted in co-operation with the industrial extension service of this college, the bureau of business and industrial extension of the University of Texas, and the Texas state board for vocational education. This program provides courses leading to trade teaching certification, the B.S. degree, and graduate degrees. The instructional staff for this program is personnel from the co-operating departments and agencies. It is a program which alternates residence annually with the University of Texas.

Graduate degrees offered in the industrial-education department of the Agricultural and Mechanical College of Texas are the master of science in industrial education, and the master of education with a major in industrial education.

The graduate program of this department has expanded rapidly in the past few years to where certain staff members are designated exclusively to the graduate program for both winter and summer terms. Since the recent war this department has brought in some very able and talented leadership through its summer guest-professor plan. These guest professors have included a state supervisor of industrial arts,

A well equipped machine shop

and supervisors of industrial education from some of the larger cities. The plans for the coming summer are to have the specialist for industrial arts from the United States Office of Education, and two city supervisors of industrial education from the Southwest.

Inestimable benefit is derived by the advanced undergraduate and graduate students through association with these leading personalities in the industrial-education field.

Practical Shop Layouts For Areas and Work Stations

GEORGE A. WILLOUGHBY
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Ypsilanti, Mich.

The layout of a school shop, or modifications of a traditional layout to meet more modern concepts of the aims of industrial arts, should be based on the educational activities to take place in the shop. These activities should, of course, be selected after careful consideration of the chief objectives of the shop instruction, the age and grade level of the students to work in the shop, funds available for the purchase of tools, machines, and supplies, and any other factors that may enter into the picture in a given school community.

If a number of plans of activity areas successfully used in shops are available to serve as guides, one planning a new shop, or additional activities in an old shop, can use these areas or "elements" of a shop plan to provide for the activities selected. Thus the shop layout could be planned to include activities based on objectives and the arrangements could be based on those found to be satisfactory in practice.

It is hoped that the layouts accompanying this article will, to some extent, serve that purpose and suggest a better approach to shop planning. They should provide usable suggestions to those who are adding activities to their present shopwork and to those interested in planning a functional layout to include numerous types of activities. The areas illustrated are some of those in our shops which have been developed during the past 18 years. Men who

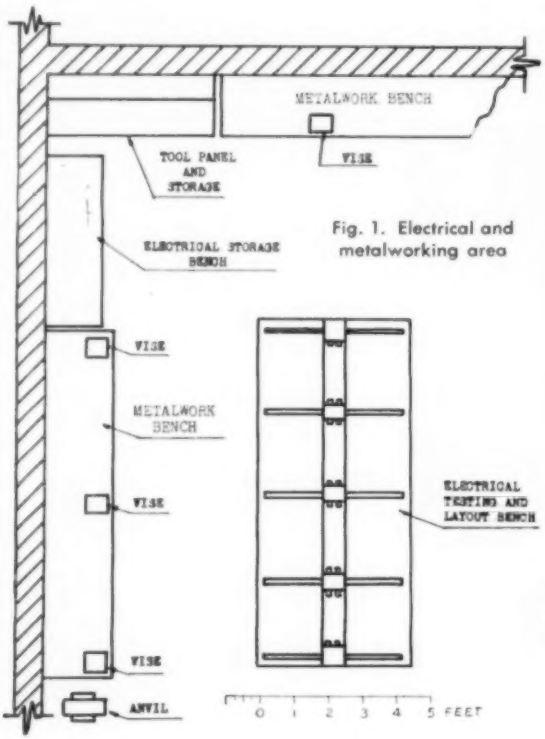


Fig. 1. Electrical and metalworking area

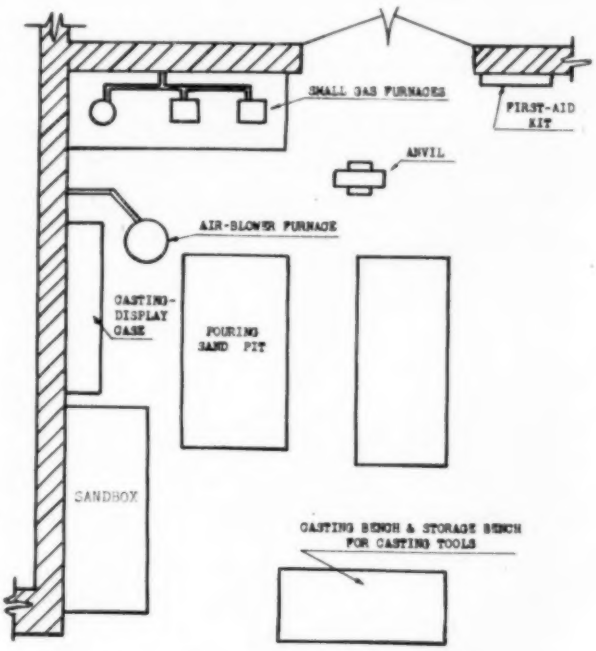


Fig. 2. Forging and casting area

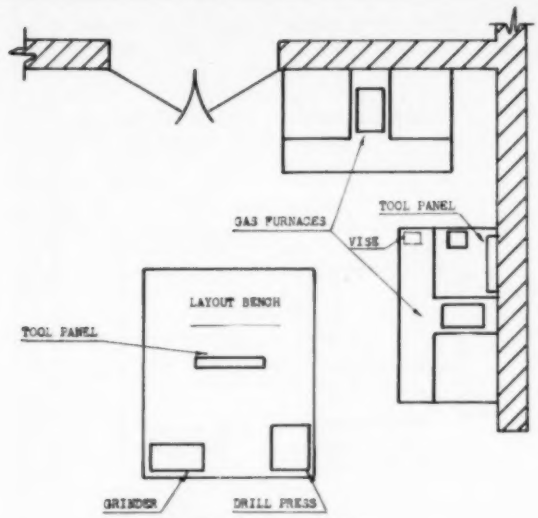


Fig. 3. Sheet-metal area

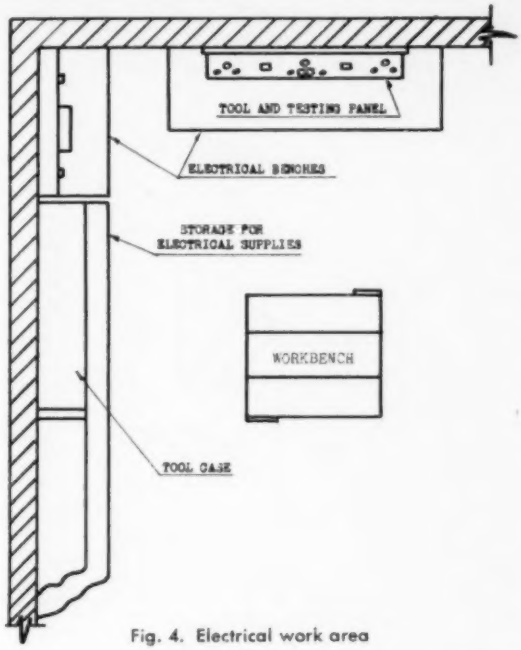


Fig. 4. Electrical work area

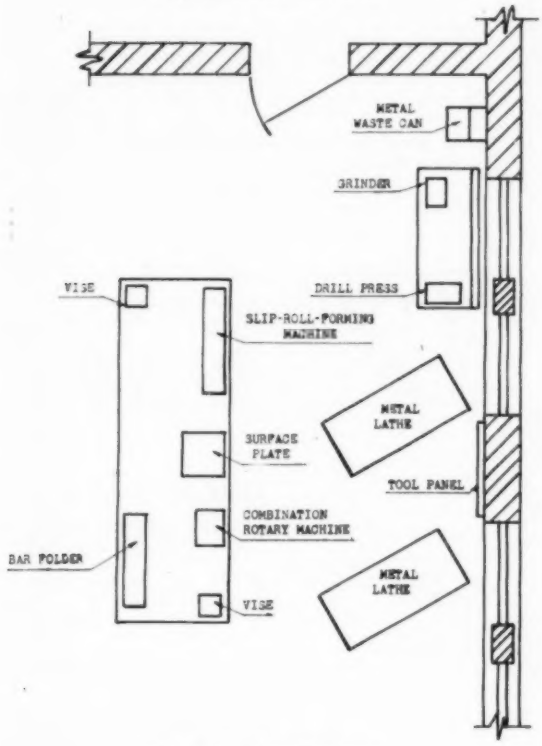


Fig. 5. Metalworking area

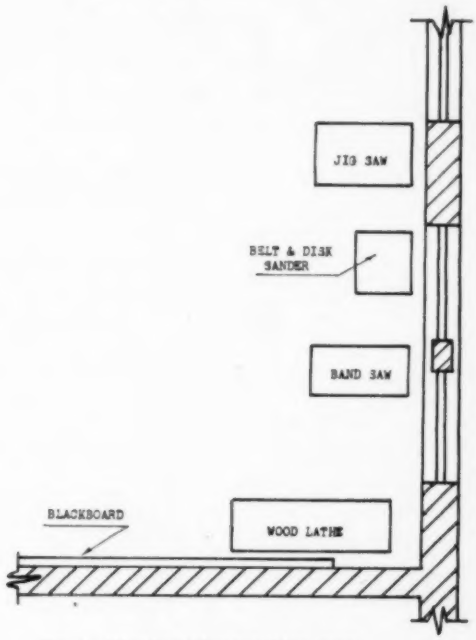


Fig. 6. Woodworking machine area

have co-operated in organizing them are Duane Chamberlain, Ralph Gildenstein, Raymond LaBounty, and Stanley A. Glow. All have provided opportunities for many students to carry on the activities indicated in a general shop program or on the unit basis.

Stanley A. Glow made the layouts that accompany this article.

To illustrate this method, let us assume that we have a traditional woodshop but that it is desired to add metalwork and electrical work. Referring to Figure 1, we see that one corner of the shop may be modified as indicated to provide these ac-

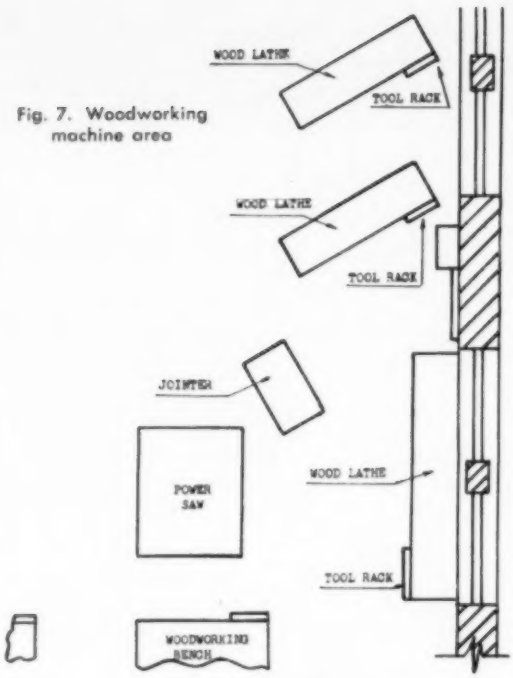


Fig. 7. Woodworking machine area

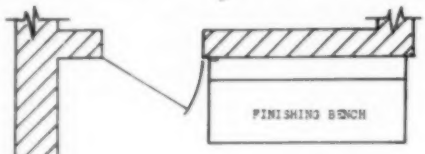
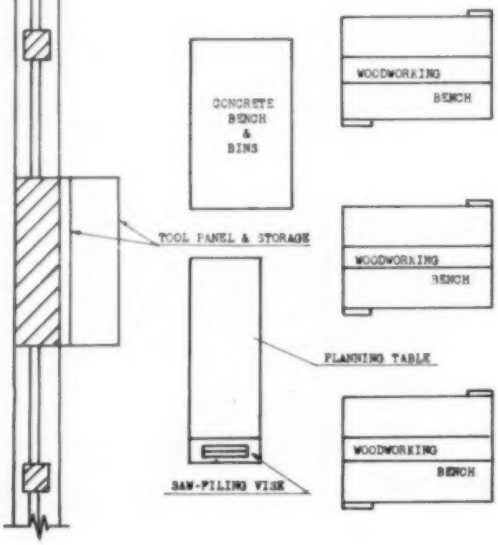


Fig. 8. Finishing, concrete, and woodworking area



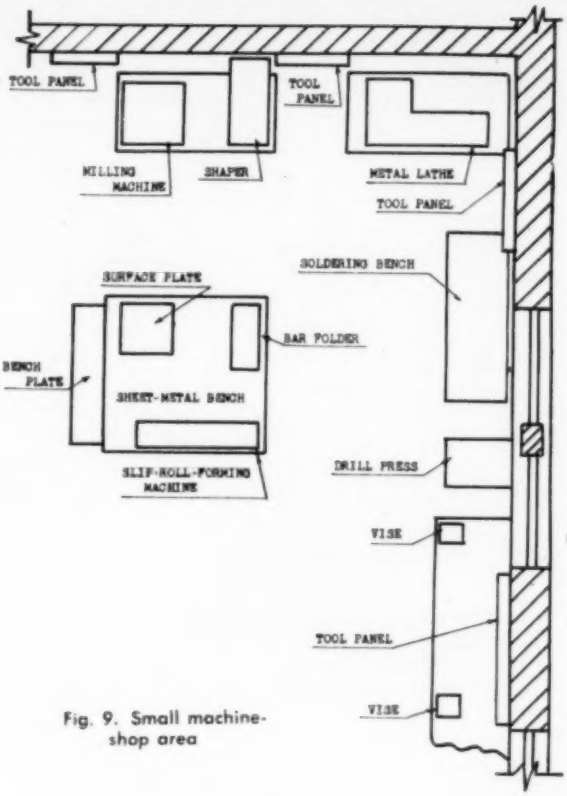


Fig. 9. Small machine-shop area

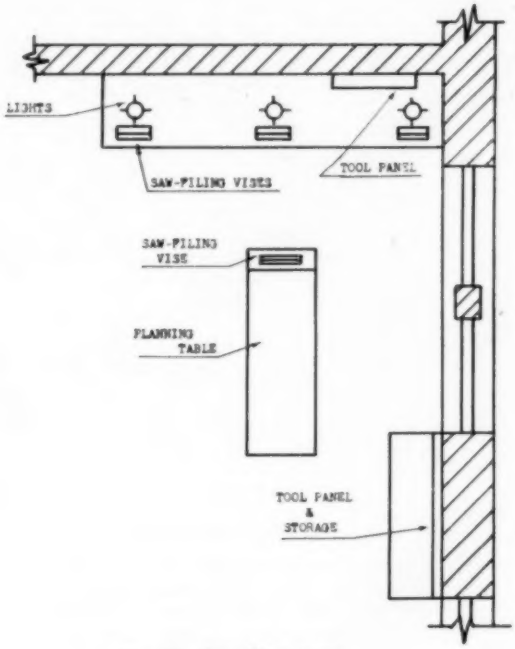


Fig. 11. Saw-filing area

tivities. By arranging benches and tool and material storage space, provision may be made for four students to work at bench metalwork and eight to work at electrical construction and testing.

To facilitate measuring distances on the layout, a small scale is given. If the distances indicated are marked on a card the approximate sizes of the benches can be determined, as well as any other measurements, desired by using the card as a scale. In this particular case, the metalwork bench is 2 by 10 ft.

If it is desired to add a metal casting area, it may be provided as illustrated in Figure 2, or a small sheet-metal working area may be provided as illustrated in Figure 3. Electric motor testing and repair may be provided in an area such as illustrated in Figure 4, using the test bench and panel illustrated and the workbenches for repair and rewinding work. Other possibilities illustrated may be incorporated by following some of the suggestions indicated by the layouts.

If this procedure is followed, many activities can be added to present setups in school shops and as the interest in these develops, additional equipment and supplies are usually forthcoming. Then the industrial-arts shop will more nearly meet the needs of students in providing vitalized general education as well as exploratory experiences, and, in some cases, lay very sound vocational foundations.

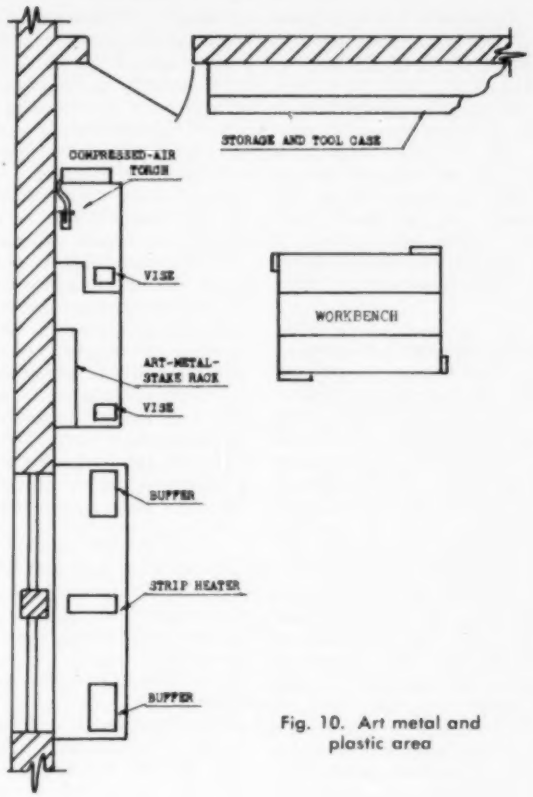


Fig. 10. Art metal and plastic area

Planning School Shops

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Iowa State College
Ames, Iowa

Seldom in the history of industrial education have we been compelled to contemplate new shop construction under such trying conditions. At present, we are faced with terrific educational needs on the one hand, and exorbitant labor and materials costs on the other. No one will deny the gravity of the present situation when we take into account that present-day living costs have slashed the 1935–39 dollar to where it is worth 52 cents on new construction, less than 49 cents on labor costs, and only 44 cents on raw materials. It is estimated that a minimum of ten billion dollars must be spent on new school construction in America if our needs are to be met. Nevertheless, many communities have deferred such construction, hoping that the Hoffman cutback figure of 25 per cent which he claims this nation must and can take, will soon become a reality.

If we are prone "to cry over spilled milk," we look back in sad retrospect to the early thirties, "when we missed the boat," and when low-cost labor and building materials were plentiful. Prices had dropped to an all-time low on machinery and hand tools. We were having a depression. Millions of men were out of work. We were endeavoring to create work for these men. Very wisely, some communities cared for their school plant needs in those days. However, there were too many localities that did not take advantage of the prevailing labor and materials prices. Today, youth is paying the price for our shortsightedness in the past, as well as our present-day distorted sense of values.

Improving Our Sense of Values

Before our youth can have the schools they so richly deserve and the shops which they need so desperately, we must do everything in our power to improve the sense of values of our people. They need to know that education is confronted with a *boom* in enrollment and a *bust* in school plants, equipment, supplies, and teachers. In addition to all of the constantly prevailing

shortages in this business of education, approximately three million youngsters were born in America during the past year. Surely a nation whose yearly expenditure for liquor, tobacco, and recreation approximates twenty billion dollars should soon spend more than three billion dollars a year for education. Frankly, education is now going backward. More than one half of the communities in the Middle West and South have no high schools. From one third to one half of our school buildings in America need replacement or major repairs.

Education Is Everybody's Business

We need to drive home to our citizenry that education is everybody's business. Like good government, education affects all of us. Without education, what would happen to our professions, businesses, and the jobs by which people gain a livelihood? Markets would actually disappear for many present-day products if people were not educated to want the goods manufactured by industry. Without vocational skills men and women could not earn enough to purchase these products. Furthermore, without adequate vocational skills, products would be of a very inferior quality, if many of them were produced at all. There is a high correlation between per capita sales and education. For instance, what would a savage do with an ensemble suit? Good schools make and attract intelligent, community-minded citizens; good schools always raise property values proportionately.

Education is absolutely essential to our national security. In a democracy such as ours every man counts; each individual is important. All of us, as we enjoy our freedom, must possess a strong and abiding sense of responsibility, for when we cease to be intelligently responsible citizens, we lose our freedom. We will have intelligently responsible people, and democracy cannot fail, if we guard well our educational system. Without appropriate and adequate education there can be no democracy. Education is the very cornerstone of a democracy, and in the words of Charles W. Toussig:

> Democracy is founded on the belief that the mass judgment of the people is sufficiently sound to direct its political authority. Such a theory must of necessity presuppose that the social and political education of the people in some measure keep pace with the advance in science, technology, and economics. It must of necessity presuppose a development in self-discipline of the individual, if he is to participate intelligently in the ever gaining complexities of national life.

Education constitutes the high road to opportunity. Go where one will, employers tell us that too often young people have no salable skills; in fact, they do not know what they want to do for a living. Good citizenship and craftsmanship are both important. Without them, the road to opportunity can well be considered closed.

If the United States is to remain in the vanguard of the world's industrial production, her workers must be prepared for industry on modern equipment in well-planned shops. Youth is faced with the serious problem of maturing in a fast-moving industrial civilization. The United States alone, with only 6 per cent of the world's population, has well over one half of the world's industrial capacity. Obviously, to get ready to participate successfully in the activities of such a world is not something that young people can do on obsolete and inadequate equipment in poorly planned shop areas. Youth cannot afford to waste time in this manner; life is too short.

Our Public Relations

Success in securing adequately equipped shops depends to a very large measure upon the quality of our public relations. Every taxpayer in the community is our employer. Our actions in school, as well as out of school, enhance or injure our public relations.

Our most immediate public is our own student body. Strange as it may seem, we forget this fact too often. It is through the students, to a very considerable extent, that we reach our adult public, the people who pay taxes in order that we may have schools with adequate shops. A satisfied student generally means a school-supporting father and mother. Where the student fails, we as teachers not only fail with him, but we fail with his parents. A successful boy in our work means adult support coming to us from the home.

We need to look further into the future when our students have matured and assumed their rightful responsibilities as adults in the community. Will their memories of us and our program be satisfying ones? Do they remember us as helpful, inspiring leaders, who through purposeful programs of work afforded them the preparation for life, which eventually spelled success? If they have reason to remember us in this manner, they will usually support us in whatever shop expansion we contemplate.

Before the people in any community will vote money for new construction, they must be sold on the needs of youth. This is as it should be. No community will move any faster than it has been educated to move. Taxpayers will be convinced of youth needs when we really know what they are, and when we can present these needs with real professional salesmanship, using the words of ordinary laymen. Securing the needs of youth in any community means a workmanlike survey by staff members, who are well grounded in research techniques. We are in no position to make intelligent recommendations, as far as shop planning and construction are concerned, unless we are able to do this. Nor are taxpayers willing to take our recommendations unless they are supported by factual evidence. Furthermore, this factual evidence must be accompanied by soundness in proposed methods of instruction and curriculum content, including a sound philosophy of education. All of this is as it should be.

Many of us are contemplating the expansion of our present programs, all of which means more equipment and more space. Constant evaluation of our present efforts is imperative. Are we operating with maximum efficiency now? Surely, we cannot expect any community to provide us with more space and additional equipment when our present efforts reflect unwise use of both. Are we teaching the maximum number of activities which can be taught with the equipment and space that we now have? Have we proved to the taxpayers what could be done if we had greater shop space and more equipment? Naturally this means a carefully outlined course of study, the functional aims of which are attainable with the present shop facilities, accompanied by a curriculum supplement which portrays what students really need in a fast moving world, and how these needs could be met with adequate shop space and equipment. Strange as it may seem, and unfair as it actually is, quite often we must prove the worth of our program with mediocre equipment and inadequate shop space. Although we are willing to proceed on such a basis for a reasonable length of time; firmly but tactfully we must insist that our young people are deserving of better opportunities to prepare themselves for life, which has become exceedingly complex.

Throughout the length and breadth of America, first-class industrial and business entrepreneurs are expanding their physical plants. These men have faith in America; they believe in America's future, they are willing to invest heavily, to stake their all. These same men know that they cannot remain in business unless they have modern, adequate plants, with which to meet present-day competition.

You and I are engaged in the greatest business in the world — education. Education is an investment, reproductive of itself; it is not a gift or an expenditure. We, too, must insist on a modern plan in which

to conduct our business, the very business upon which rests the fate of our nation.

The Superintendent of Schools

Fortunate, indeed, is the community which has a school superintendent who is willing and able to bring the talents of a maximum number of people to bear upon the problem of school planning. Everyone, from the custodian to the president of the board of education, is in the picture. Skillfully the superintendent articulates the efforts of all. Ultimately, he gains the approval of the board of education to the pooled efforts of the staff and the architect. Thus the plan is a staff plan rightfully claimed by the staff. A staff plan, executed by the architect, makes for a happier faculty when the building itself has been completed.

The Architect

The right choice of an architect is paramount. That he knows the technical phases of his work is not enough. He must be an individual who will work with any and all of the people who are to teach in the school and its shops. The kind of architect needed in school and shop planning is the one who takes suggestions from the school staff, and who incorporates staff recommendations into the school and shop plan. He realizes that staff members know school problems better than he does, and that after all, they must live and work in the building after its completion.

Organization and Responsibilities of the Staff

The industrial education staff is organized as a planning group with the supervisor or director acting in the capacity of the chairman. Naturally, he is a key person whose responsibilities are manifold:

1. He secures the respect and confidence of his staff at all times, all of which begets the maximum co-operation and effort from the staff.

2. His approach is such that teachers and administrators in other departments as well as the superintendent, board of education, the architect, and the laymen in the community have faith in his leadership.

3. In his teaching he has gained the respect of students.

4. He knows that he is directly responsible to the superintendent, and he works through him at all times. He does not by-pass around the superintendent to the architect, or to the board of education. Because of this very proper attitude, he enjoys the confidence of the superintendent, who in turn keeps him informed regarding developments in the architect's office, and in the meetings of the board of education.

5. The supervisor or director knows the contemplated school plan in toto, in order that he can guide his staff intelligently, and make their efforts fit into the whole building pattern.

6. He enjoys the confidence of labor, business, and industry, and solicits their suggestions and incorporates them into the plan.

7. Parents count with him, and their recommendations are important.

8. Student suggestions are solicited.

9. He has visited other schools and he has encouraged his teachers to accept the best ideas and to incorporate them into their plans.

10. He knows building construction, current building codes, and standards.

11. He knows machinery and equipment.

12. The director has a sound philosophy of education, and holds firmly to the principle that schools are built primarily for youth, but must also be accessible to the community at large, when used for worthy purposes.

13. Common sense and practicality permeate his planning.

14. He has the ability and the courage to meet the kind of opposition which would deprive youth of the school facilities so essential to them.

15. When called upon by the superintendent to present his ideas and those of his staff to the architect, board of education, city council, or a public gathering, he can do this convincingly, with dispatch, and clarity.

16. He knows when to make concessions, and when to stand firmly for the welfare of youth.

17. The supervisor or director should so direct the planning that at no time are any *dirty linens* washed in public places. There will be differences, but these differences must be settled in staff meetings, necessitating compromises, of course.

18. When staff members have completed their plans, it is the director's job to check them, and to make the necessary corrections with the teacher. These plans can then be fitted together and synchronized into a completed industrial education unit.

19. No doubt, the architect will draw his plans to a scale of $\frac{1}{8}$ in. equals a foot. Here again the director checks the plan, this time with the architect.

20. The director may be called in by the superintendent to meet with the board of education and the architect when the plans and specifications have been completed. His is the all-important task of justifying the plan and the specified equipment.

Fortunate is the teacher who finds himself working with administrators who operate in the democratic way. On the other hand, such a privilege places added responsibilities on the instructor, which he should accept and shoulder to the very best of his ability. He, too, has some professional responsibilities peculiar to his position:

1. He needs to realize that he is directly responsible to his supervisor or director, and that at no time does he by-pass him.

2. Each teacher must assume the role of a subject specialist, and be able to satisfactorily create and to defend his plan.

3. He is willing to fit his shop layout into the general plan agreed upon by the departmental staff.

4. His plan must be correct in every detail, so that it cannot be unduly criticized by the superintendent, architect, or board of education. Valuable prestige can be lost through careless planning and poor drafting techniques. The layout could very well be made to a scale of $\frac{3}{16}$-in. equals 1 ft., with all of the machinery, furniture, and cabinets appropriately placed upon the plan.

5. When each teacher's shop layout has been incorporated into a total plan of the industrial education wing, $\frac{1}{4}$-in. scale, every instructor should speak well of it, for it represents his best efforts, as well as those of his associates. We can hardly expect others to think well of our efforts, if we are not enthusiastic about them ourselves.

In the small school where a shop is being contemplated, and where the shop teacher is already on the scene, he is directly responsible to the principal and he in turn to the superintendent. The shopman in this case draws the shop plan, and articulates his efforts with other staff members responsible for the planning of new construction.

Selecting the School Site

The selection of a suitable school site constitutes a grave responsibility. Where foresighted citizens see far enough into the future to set aside certain areas for school purposes, easily attainable at the time, the problem is already solved. However, where this foresight has been lacking, a serious community controversy can well arise when the construction of a new school becomes necessary. To prevent such a controversy, taxpayers must overcome their prejudices and personal desires. They must be willing to settle their differences through compromise. The future welfare of the young people in the community should be the paramount consideration. This may mean that businessmen cannot have this school as near their places of business as they first anticipated. Parents may find that their offspring need to travel farther than they would like to have them go. However, within certain limits, the problem of distance

should be held a secondary difficulty, if the student can have a good school with adequate grounds surrounding it.

There are certain requisites to a school site which might well be called imperatives:

1. The school site should afford adequate space for the original building and its future expansion.
2. There should be adequate grounds for a football field and intramural activities.
3. In so far as possible the property should be free from dangerous traffic.
4. Accessible and adequate parking areas should be available.
5. When selecting a school site we need to foresee the amount and direction of the community's growth.
6. The site needs to provide an environment free of smoke, noise, dirt, and odors.
7. The feasibility of satisfactory landscaping cannot be overlooked.
8. Possibilities for the construction of suitable driveway approaches to essential parts of the building, including the various shops in the industrial education wing.

The Shop Unit

Shops should be housed in a single wing situated in the rear of the main building and attached to it, readily accessible from the central hallway. The unit could well be a one-story structure with adequate footings, walls, and roof joists, in order that a second story could be added in the future. The ground floor should be at least a foot above the grade line. When enrollments warrant it, and the needs of pupils demand it, we might very well plan to have a drafting room, print shop, aeronautics shop, machine shop, automotive shop, a combination class and audio-visual education room, electrical shop, and a woodworking shop with a dustproof finishing room. The noisiest shop, which is generally the woodshop, should be placed furthest away from the main building. An eight-ft. hall could very well extend from the woodshop to the main building, with the other shops arranged on both sides of the hallway. Adequate toilet facilities should be provided in a centrally located room. The director's office should be conveniently placed. Exhibit cases and even a small display room should be provided adjacent to the hallway as one enters the unit from the main building.

The Shops

Each shop should be complete in itself. For example, it should not be necessary for a student or the teacher to leave the woodworking shop and travel down the hallway to secure lumber from another room. Shops should be at least 30 ft. wide and long enough to accommodate equipment and provide sufficient working space for a minimum of 24 boys. Each shop should have a demonstration area which includes a demonstration bench and comfortable seats for 24 students. Ample storage space for supplies, tools, books, and student work, is essential. Wood block floors and acoustically treated ceilings are most desirable. A washing station with a drinking fountain adds to the completeness of the shop. Tool rooms are necessary only in the shops where heavy machine accessories are used. Hinged tool panels will suffice in the others. The woodworking shop, machine shop, automotive shop, and electrical shop should have outside double doors for loading and unloading. All shops should have doors leading into the hallway. Gas, compressed air, 220-volt and 110-volt electrical current need to be provided wherever necessary. An assembly area is essential in the woodworking shop. The automotive shop should have a substantial off-the-street area outside the shop.

Adequate bulletin boards and blackboards are necessary in every shop. The ceiling beams should be heavy enough so that no posts of any kind appear in the shops. Plain walls should prevail. Thus, each teacher has clear vision in his shop where he can readily supervise the activity of every boy. There is a place for everything, and through his shop management program he can hold his students responsible for leaving everything in place. Many disciplinary problems never arise where shops are properly planned.

Safety

Safety is paramount in any shop. Industry is making most commendable progress in this all-important endeavor, because proper attitudes toward safety on the part of workers are being encouraged on well-guarded machines. Nevertheless, the accident rate, as well as the death rate in and around machinery in a mechanized America is appalling. It is imperative that safety be taught with transfer of learning in mind, in order that there will be a greater carry-over of this instruction into our homes and to our highways, farms, and industries. Obviously, this cannot be done on obsolete or badly designed machines. Neither can it be done in poorly arranged shops, even though the equipment is good. Certain essential rules need to be observed as we plan our shops:

1. Conduits should be embedded in the floors and walls, with adequate wiring.
2. All electrical switches should be properly enclosed.
3. Switches on machines should be within easy reach of the operator.
4. Proper wiring of the machine is important.
5. The shop temperature of 68 to 70 deg. should be maintained automatically five feet above the floor.
6. Adequate storage facilities add to the safety of any shop.
7. Stairways and balconies, when necessary, should have adequate railings.
8. Belts and all of the moving parts of machines should be guarded.
9. Safety zones should be marked around hazardous machines.
10. Diesel and gas engine exhausts should be muffled and discharged through adequate piping to the outside of the building.
11. Mats of nonskid materials should be provided where necessary.
12. Machines should be so located as to eliminate interference between operators.
13. Low ceilings are objectionable. Shops 12 to 14 ft. high are to be recommended.
14. Poorly ventilated shops are not conducive to safety. Mechanical ventilation should be provided wherever necessary.
15. Inadequate lighting adds to the hazards of any shop. General lighting should be supplemented with additional local lighting on all machines and areas where precision work is done. Illumination should be glare-free and shadow-free.
16. Sectional feed rolls should be provided on machines where necessary.
17. Tool rests should be adequate and should operate freely.
18. A good blower system is a vital asset to any woodworking shop equipped with machinery.
19. Exhaust systems should be provided in the shops where there are gases, vapors, fumes, odors, smoke, or dust.
20. Waste cans are essential.
21. Welding and grinding goggles should always be available.
22. Machines need to be fastened securely to the floor.
23. Where portable machines are used, double electrical wall outlets should be conveniently located.
24. Light and power controls should be provided on a locked master control panel, with a pilot light situated near the instructor's desk.
25. Machines which are used for roughing out stock need to be placed near the stock room.
26. The average elbow height of a student generally constitutes a good operation level for equipment.
27. Mounting machinery on columns, or against pipes, transmits noise.
28. Fire extinguishers constitute essential equipment.

29. The first aid kit is an absolute necessity.

30. Appropriate gas welding tank storage should be provided outside of the welding shop.

31. Every effort should be made to plan shops which are kept clean easily, for an orderly shop is a safe shop.

In the final analysis, the greatest single factor in any successful safety program is the instructor's example. Proper safety attitudes and practices are learned from a safe teacher in a safe shop.

Color Dynamics

When contemplating the painting of shop interiors, color dynamics should be utilized to the fullest extent. It costs very little more to employ color dynamics than it does to paint. We have too often painted in grays and ivories, if we have painted at all.

Color dynamics requires the use of colors readily recognized by the human eye. Obviously, the focal colors are red, yellow, green, blue, and white. Ceilings need to be white, while the walls should be a medium green. The machines are colored with a darker green, dark enough to create a pleasing contrast between walls and machinery. Fire equipment, switch and fuse boxes should be painted red. Machine controls and areas of potential danger are indicated in yellow. In order to reduce eye fatigue, floors should be painted gray.

The advantages of focal colors in our shops are many. They are naturally restful to the eyes. Focal colors increase morale and insure greater shop safety. They stimulate students to greater effort, resulting in better and increased production. With colors properly used, the shop becomes a cheerful place in which to work, and students are deserving of such environment. Nervousness may be reduced, the student's attitude toward the work improves, and better physical well-being results in greater emotional control. Yes, even disciplinary problems tend to vanish.

Industries in ever increasing numbers are recognizing the benefits derived from color dynamics. Schools should do likewise, for happy, efficient people should be found in them, as well. Color dynamics in our shops will prove a wise, paying investment, which is not always readily measured. What is more, in employing the focal colors that are demanded by color dynamics, we are bringing a recognized work-a-day world environment into our shops.

The General and the Unit Shop

We now have in existence at least two types of shops, as far as organization is concerned.

1. There is the composite general shop, designed primarily for the small high school, where several different activities are promoted simultaneously. The number of activities engaged in by the students will depend very largely upon the ability of the teacher. The teacher should know his limitations in order that the class does not get away from him. Unless we employ common sense, the program in this type of shop can degenerate into a smattering of uncontrollable activities, too numerous to make sense. The number of activities should be held within reason, for if this is not done, false impressions of these activities will be created in the student's mind; slovenly habits of work will be promoted, often unknowingly.

2. Where enrollments warrant it, the unit shop still constitutes the better type of organization. The teacher can do a real job of teaching, for the work of each class is limited to a single activity. Short tryout courses can be taught, or the emphasis can be placed upon skills in a single field. The goal can be general education, or the development of trade skills, as the case may be. Good work habits can be developed, and sound attitudes created toward each subject.

Goals

Constantly, we need to keep in mind the desired goals in industrial education on all levels in our public school system.

In the elementary school the boys and girls are anxious to use their hands. They wish to create, to construct something from such materials as wood, paper, clay, reed, raffia, metal, and plastics. Formalized shop programs are not an imperative in the elementary school, for many of the hand activities can be taught in the classroom. However, a workshop in the elementary school is not out of place. Industrial-arts work contributes to the general development of the child.

The junior high school period, grades seven through nine, is one of exploration, experimentation, and self-finding. In our better school systems the student is afforded an opportunity to explore in a considerable number of worth-while shop activities. He is endeavoring to discover his strengths and his weaknesses, his likes, as well as his dislikes.

The senior high school program is closely articulated with the offering in the junior high school. It continues to be general education for many. Others turn their attention to trade preparation, for they must learn a trade in order to earn a livelihood. To them, the senior high school may constitute their last formal educational experience.

As we plan and build, may we always be worthy of the confidence which the community places in us. May we choose practical and attainable goals, goals dictated to us by the real needs of youth. Let us always be realistic, honest, and courageous, and when the task is completed, the appropriateness of William Henry Scott's lines on "Dedicating the School" may be a fitting climax:

> Let us now with earnest hearts and with exalted faith and hope solemnly consecrate this building to its high and holy purpose. May the youth of this community for generations to come gather in this place to receive instruction in knowledge and training in virtue. May they find here every condition necessary to a true and enlightened education. Especially, may their teachers be examples of excellence in scholarship and character, seekers after goodness and truth, lovers of children, enthusiasts and adepts in the finest of all arts, the development and inspiration of human souls. May these rooms always be pervaded with an invigorating atmosphere of mental and moral life, and may no child pass from these schools to higher grades or to the outer world without having been made more intelligent, more thoughtful, more courageous, more virtuous, and in every way more capable of wise and just, of useful and noble living. To this end, may the blessing of God be upon child and parent, upon pupil and teacher, upon principal and superintendent, and upon everyone whose influence will in any degree affect the work of education as it shall be conducted within these walls.

The basic lessons regarding money can well be learned in school. As the average human being finds saving a difficult discipline to master, what is better than an activity such as the School Savings Program, which makes actual saving a part of teaching? — *T. E. Wilson in the spring, 1949, School Savings Journal.*

A Course in School Shop Planning

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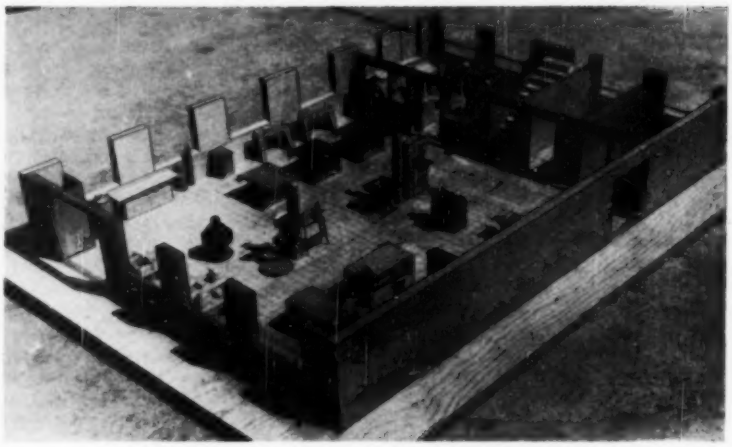

Fig. 3. Model shop built and equipped by members of the shop planning course

On Tuesday, October 1, 1948, Dr. Fred Strickler, long-time professor of education at Columbia University, began his new duties as dean of the industrial-arts division at Bradley University in Peoria, Ill. He succeeded the beloved and highly respected Dean Siepert who died April 30, 1947. As Dr. Strickler settled down in his new position he began planning for the future. As a preliminary phase of his long-time plan he arranged for a series of visiting professors for the 1948 summer session. Four men from widely separated places made up the visiting faculty. Dr. Robert E. Smith, professor of education at Ohio State University, conducted the first two weeks' course on the subject, "Industrial Arts Curriculum Analysis and Construction." Dr. DeWitt Hunt, head, Department of Industrial Arts Education and Engineering Shopwork, Oklahoma A. and M. College, Stillwater, Okla., taught a two weeks' course in "School Shop Planning." Dr. Thomas A. Hippaka, professor of industrial education, Iowa State College, Ames, Iowa, taught a two weeks' course on "Evaluation in Industrial Education" and Dr. C. Kenneth Beach, professor of industrial education, Cornell University, Ithaca, N. Y., closed the series with a two weeks' course on "Current Trends and Developments in Industrial Education." The courses proved quite popular with an average enrollment of about 34 men from a dozen states and two nations. Figure I shows the persons enrolled in the second two-week course.

Fig. 1. Persons enrolled in the shop planning course

In addition to a revised curriculum leading to the degrees of bachelor of science and master of science in industrial-arts education and a strengthened summer school offering, Dr. Strickler and his administrative associates and advisers are considering installing a program of studies leading to the doctor of education degree. Because of the central geographic location and the current growth of Bradley University it would seem that this is a timely move. Many teachers from states having teacher training institutions that do not offer doctor's degrees, in industrial-arts education, will welcome the opportunity to work toward this degree in the long summer sessions at Bradley.

The writer, having been given a choice, elected to teach a course in school shop planning. The following topics were considered, formal lectures being presented on each subject with selected students writing reports on these subjects.

Preliminary Consideration

Template method of school shop planning
Scale model method of school shop planning
Check lists for school shop planning
Controls effected by site, contour, and size
Co-operating with state agencies in school shop planning
The shop or shops in a separate building

The Building

Ceiling heights and ceilings
Floor level, stairs, ramps, and loading docks
The use of mezzanines
Walls, structural

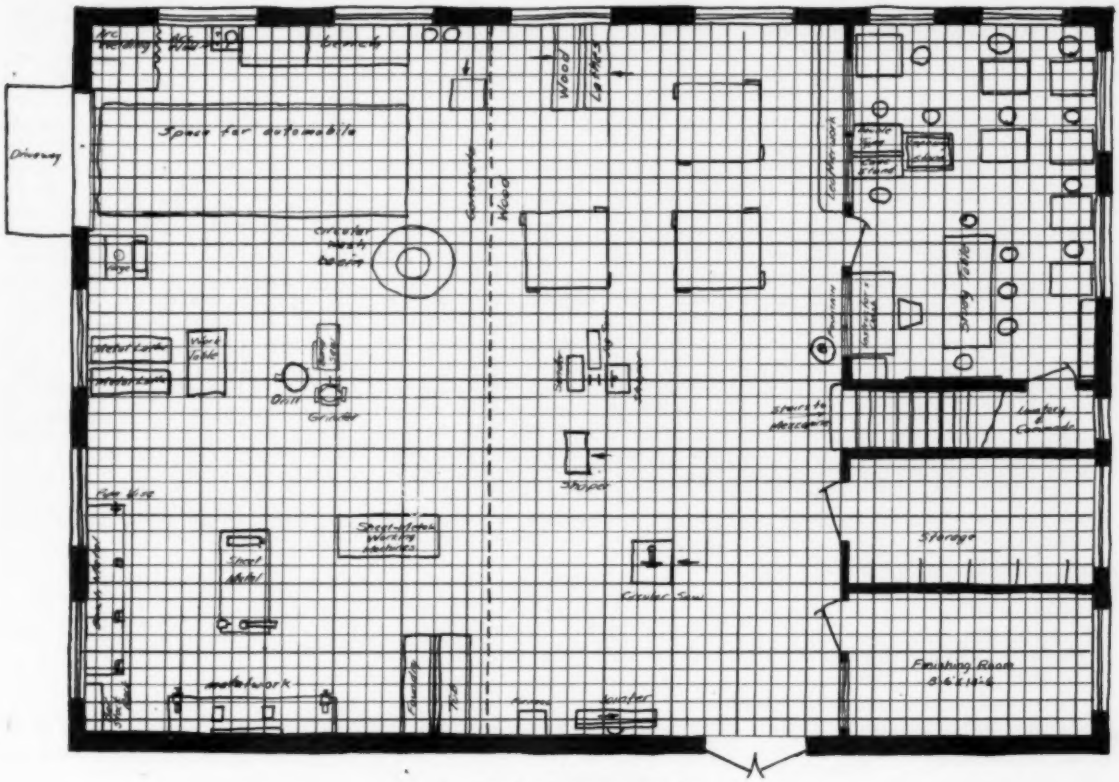

Fig. 2. Sketch of community shop

Walls, inside, finish, noise abatement
Doors, personal access and double, folding or overhead
Partitions
Floors
Windows, glass area, types, sill height, location, etc. (Fenestration)
Heating the school shop
Lumber rooms, stock rooms, and supplies rooms
Planning rooms
Finishing rooms
Blueprint and photography rooms
Types of roofs on the school shops and posts in the school shop
Artificial light in the school shop including convenience outlets
Gas, air, and water lines in the school shop
Special provision for visual aids
The power control panel in the school shop
Methods of providing power at machine locations
Other electrical provisions, radio, public-address system, telephone, buzzer, etc.
Access through hallways and covered passage
Chalkboards and bulletin boards
Special fire protection including sprinkler systems and extinguishers

Color in the school shop
Pupil assembly space
Lockers for project storage
Planning the toolroom
Planning tool cupboards for individual shop subjects
Planning open tool boards
Dust collecting systems
Built-in provisions for project storage
Floor drains and drinking fountains
Nonskid floor areas, rubber panels under switches, safety marking

The Equipment

Sizes of equipment to buy
Safety specifications for machines
Special problems in selecting hand tools
Special problems in selecting vises
Special problems in selecting woodworking benches
Selecting and locating drawing tables
Standard brand tools and machines vs. new, unknown, and local brands
Space requirements for individual machines
Diagonal vs. rectangular location of benches and machines
Locating woodworking benches
Selecting sheet-metal benches
Exhibit cases, location and design

Each student also reviewed all articles on school shop planning found in one volume of industrial-education periodicals. These written reports were bound in a heavy notebook cover and the notebook was deposited in the Bradley University Library as a permanent record of the work of the class.

Another enterprise, which resulted in a second physical record of the work of the class, was the construction of a model shop fully equipped with scale models of machines and equipment. The basis for determining the type of shop to be planned and constructed was the needs of the community served by the teacher in the one-teacher shop. In the smaller city or large rural high school the shopwork program should be designed to provide exploratory courses for seventh- or eighth-grade boys. A one-year course for farm youths in which fundamentals of farm mechanics are covered is a possibility, as is a home-mechanics course for girls. High school courses in regular industrial-arts subjects such as hand woodworking, machine woodworking, in-

dustrial drawing, sheet-metal work, bench metal work, welding, foundry practice, etc., can be conducted in the shop planned. Craft courses such as leatherwork, art metal work, plastics, etc., can be conducted in this shop by the simple provision of the special hand tools required. This shop would also meet adequately the needs of those adults in the community who want and are due the opportunity to work in a well-equipped shop in night classes. The name "The Community Shop" was proposed by the instructor for the one-teacher shop being planned.

With the assistance of the graduating students in the class acting as an advisory committee, the model shop was planned. A freehand sketch drawn to a scale of ¼ in. equals 1 ft., on cross-section paper was approved by the committee. See Figure 2. Each of the 31 students in the class was assigned to make a part of the model of the shop or one or more machines, benches, or other items of equipment in the shop. The shop building or room has a floor size of 44 by 62 ft. with a mezzanine floor of 14 ft. 6 in. by 44 ft. in size. The use of a mezzanine requires a ceiling height of not less than 16 ft. Figure 3 shows the model shop with its full complement of equipment, the mezzanine floor, and the location of doors, windows, exhibit areas, etc. By locating the shop room at the end of a wing of a main building or as a separate building on the school campus, this ceiling height can be provided. A graphic-arts and planning room is included, which is also used as the teacher's office. It contains six drawing tables and the simple printing equipment. Smaller rooms are provided for finishing, lumber storage, supplies, and toilet facilities. In the entrance hall two exhibit cases are built into the walls.

A small school industrial-arts department planned as a community shop requires the inclusion of an extensive array of examples of industrial processes and activities. In the model designed and made by students in the Bradley University summer school class, the following industrial-arts subjects can be taught: hand woodworking, machine woodworking, bench metal work, foundry practice, welding (arc and oxyacetylene) printing, industrial drawing, sheet-metal work, electrical work, and such craft subjects as art leather work, art metal work, and plastics working. The teacher who assumes charge of a shop like this must be especially trained in both the philosophy of meeting simultaneously several groups of pupils engaged in as many separate industrial-arts activities or subjects, and in the special methods of teaching, and in the techniques of organization necessary to operate a community shop.

In addition to the participation in the building of the model shop, each student was required to design a shop or drafting room of his own choice. The technique of drawing these plans freehand on graph paper was adopted. The sketched plan shown in Figure 2 was used as a guide for the work of the students. Many types of unit shops, general shops, and drafting rooms were produced.

Tool Storage

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The problem of tool storage is a major one where different people use the tools singularly or in group undertakings. There is no perfect system that will prove satisfactory in any and all situations encountered, as each individual case must be handled separately for best results. When an industrial-arts department is being organized, revised, or expanded, the problem of storing tools is always present.

Probably, one of the most difficult cases is to use limited funds in revising an old department or creating a new department, in a building not designed or built specifically for an over-all program of industrial arts, and still select a tool storage system which will meet adequately the demand of present and possible future needs. Some questions to be answered are as follows: Without complete renovation of the building, is there a centrally located area that could be used for tool storage? Is it located to afford the least possible confusion when students desire to secure or replace tools? Is the space adequate for present needs and possible future expansion? Does the area afford enough space for good safety practice in handling tools? Is the system to be the open tool panel, the toolroom check-out type, or the open tool panel within the toolroom, or some other system?

Each teacher must satisfy himself and possibly other requirements as well as meet the needs for the kind of program offered, such as: the unit, general, or multiple-activity shop.

Open tool panels within the so-called toolroom have served adequately in several cases where various areas of instruction are

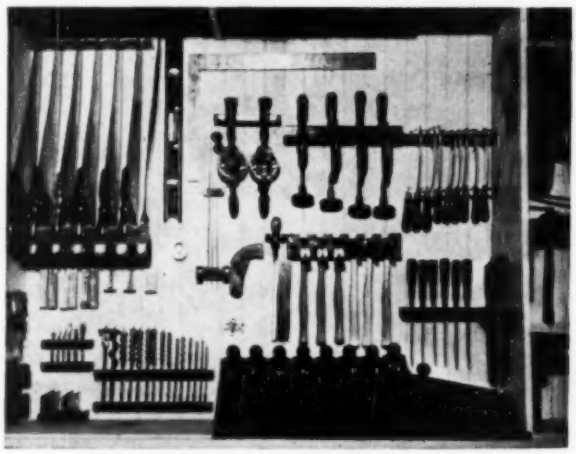


Fig. 1. Tool panel for the woodworking shop

taught in the industrial-arts building in the same or adjoining rooms at the same or different times. This system of tool management also serves well in many instances where it is necessary to store the small consumable supplies in the toolroom. Open or closed cabinets built below tool panels for supplies conserve space as well as making them easily accessible. This type of area promotes efficient checking of tools and supplies for all areas of instruction, conserves space by having this area of the shop centralized, makes all tools more accessible where there is an overlapping of tool usage in different courses or areas, as in the multiple-activity shop, gives the student a good incentive properly to care for, use, and replace tools neatly arranged, and allows tools to be grouped and mounted according to type, size, and usage in various panels all in one room or area.

This method of handling tools and supplies also works in well with the *"Modern Shop Organization for Industrial Arts Classes"* described in a recent booklet by this name, by Prof. Chris H. Groneman, acting head of the industrial education dept. of Texas A. & M. College. This method of tool storage can be used effectively in many industrial education systems as well as other departments, whether the toolroom foreman checks out tools and small supplies to each student individually or whether the students get tools and supplies at their own discretion.

The number, kind, and size of tools needed, and their mounting may have some effect on the type of area chosen for tool storage and the system used in handling them. For ordinary tools used in industrial arts, the mountings made from metal and other special materials are excellent but most of those made from hardwoods are usually adequate as well as easily replaced and expanded if additional tools justify revision on the size of mounting.

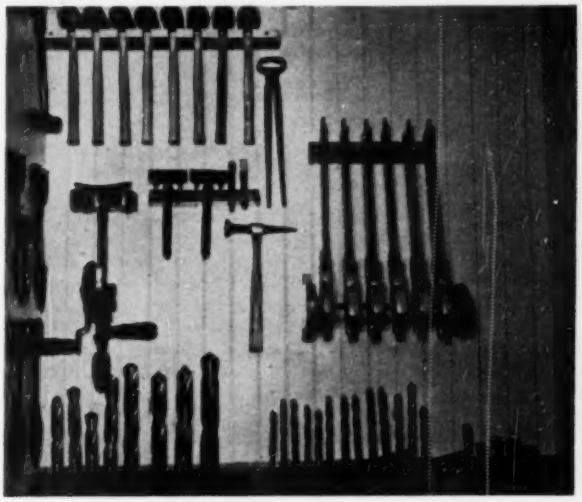


Fig. 2. Open panel for special tools

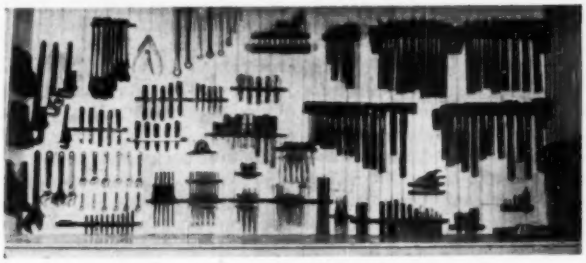


Fig. 3. Panel for tools for metalwork activities

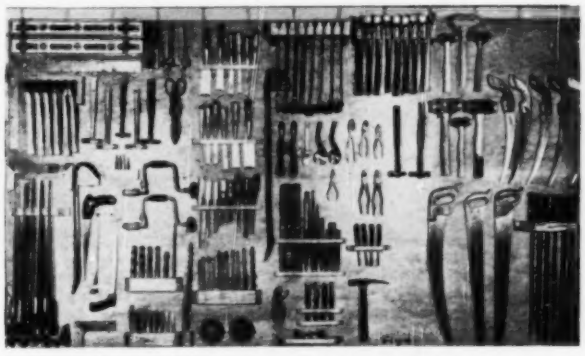


Fig. 4. Portable tool panel for diversified activities

Figures 1, 2, and 3, show parts of tool panels and storage areas in the toolroom just discussed.

Figure 4 shows a portable type of tool panel in the toolroom as used by the School of Applied Forestry at Arkansas A. & M. This kind of tool panel may be made to any desired size and opened on both sides if necessary or closed in with a narrow box-type construction with doors. By making it on a small scale of the latter type and adding casters to make it more mobile it could be adapted for use in the elementary grades. One panel of this nature would make tools available to be moved at various times to several elementary classes in craftwork if limited funds prevented having a shop or tools for each individual class or grade. The size, amount, and kind of tools mounted would depend on the situation for which it is to be used.

COLD LIGHT

Luminescence is the term used for the emission of *cold* light — that is, light that is produced without heat. The firefly emits a cold light. Fluorescent light, produced by the tubular type lamps, is another type of "cold" light. "Luminous" paint and plastics also emit cold light — that is, after being charged by natural or artificial light sometime during the day. — *The New Jersey Zinc Co.*

Kenosha Builds a New Vocational School

H. M. CLARK
Director, Kenosha School of Vocational and Adult Education
Kenosha, Wis.

A new vocational school is in process of construction in Kenosha. The building, while being strictly functional in design, is architecturally beautiful with its Lannon stone trim and its sound construction.

At this time, the building is enclosed and the plasterers have taken over. The main floor (second story) is finish plastered. Electricians are installing light fixtures in the shop wings, Bradley wash fountains are installed in these shops, and heat convectors are piled on the shop floor ready to be installed.

The building will cost $1,000,000, without the furnishings. The contractor is the George Sollitt Construction Company of Chicago. Local workmen are used throughout the construction.

Plans for a new vocational school were drawn in 1925 and again in 1935 but general economic conditions prevented construction at that time.

In 1944, the vocational school board and the director discussed a new project. The members who felt strongly that our project should go forward were: Ralph Y. Cooper, president of Coopers Inc.; Morton C. Frost, president of Frost Mfg. Co.; Wm. H. Byrne, business agent of the Carpenters' local; Norman Hawes, journeyman electrician; and Forrest E. Conner, superintendent of schools. In 1947, Mr. Hawes became owner of his own business and John Reid, a journeyman painter, was elected to the board. H. M. Clark was director at that time.

The firm of McCaughey and Petersen, architects of Park Ridge, Ill., were elected and designed a TT building to supply 100,000 square feet of floor space.

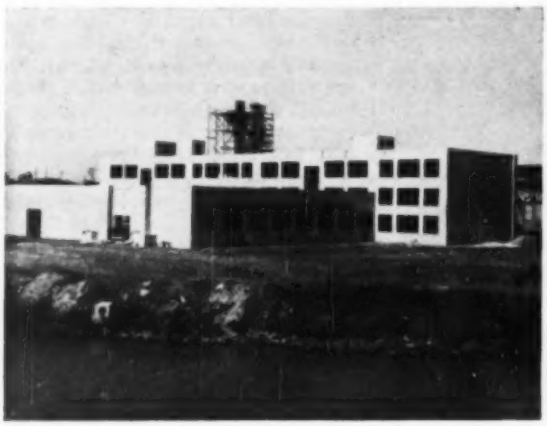
The heads of the T's form a 3-story academic and homemaking building 85 by 270 ft. The heating plant is located in the N.W. basement of this building.

The bases of the T's are one story shop wings 85 by 120 ft., each wing designed to house 8 shops. The space between the bases of the T's forms a court 50 by 120 ft. which is enclosed to be architecturally sound when viewed from the city side of the harbor.

The ground site was selected after 13 suggested locations were surveyed and after discussions with the city council and the city planning commission. The site consists of 5 acres, 701 by 406 ft. and is located on the corner of 6th Avenue (Main Street) and 52nd Street. 52nd Street is a major artery of traffic in the city's future plans on the east and north, and the building is surrounded on the southeast, south and west by the harbor.

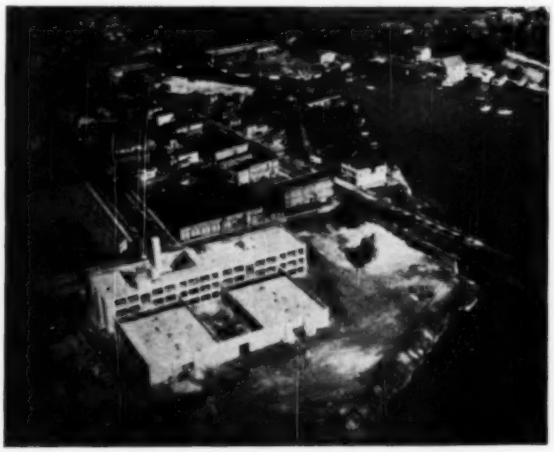
The site was selected for these reasons: (1) It was the lowest priced of seven plots which were surveyed. (2) It was one of two plots already vacant. (3) It required no costly condemnation proceedings. (4) It provided ample space on which to build and on which to expand, plus parking and play area. (5) It met all requirements of civic planning commission. (6) The State Board of Vocational and Adult Education and state local directors advocated "downtown" as best location for a new vocational school. (7) It is located between Main Street and Sheridan Road for easy access from two main roadways. (8) It is convenient for trolley service, located as it is within 4 blocks of the junction of all trolley lines in the city at 56th Street and 6th Avenue.

The building has 44 rooms, 34 of which are major classrooms. It will get our school activities under one roof which at present occupy a main building of 4 teaching rooms and 15 portables, plus 2 rented rooms in



New Kenosha Vocational School. Taken about November 1, 1948, from Main Street bridge. Shows scaffolding and hoist at chimney. Fire was started November 10th to dry plaster

— School Student Photo Service



The view from the airplane was taken by Herb Walraven of Kenosha airport. Shows harbor and bridge on right (6th Avenue), clearly shows academic main building and the two shop wings (1 story) with 50 by 120-ft. court which will be used to store 2 school airplanes and for live test of auto and airplane engines

This view of the west shop wing shows steel sash and steel roof trusses in place. The brick is a buff with shadowy gray markings. The other view shows the Lannon stone trim at the south shop entrance, and the cut stone base
— Student Photos

the city. Evening school has required as many as 19 other buildings as meeting places in the city, as for example in the year 1939–40 when over 5000 people were enrolled in day and evening school.

It makes adequate provision for the new practical nursing school; the University of Wisconsin Extension, visual education room which will double as an assembly room; a modern science laboratory; the airplane and airplane engine school; a foundry; distributive education; a health room; rugs and weaving; business machines; arc and oxy weld shops; radio and refrigeration; a photography laboratory; and storage rooms. These teaching rooms are approximately one-third larger than the rooms in the barracks at present.

Steel trusses were used to support floors and roof. The inside walls are of pyrobar or gypsum block construction. Washrooms will have terrazzo floors, and classrooms and halls will be asphalt tile.

The heating is stoker type with two boilers which are automatically controlled. A large steam convector heats the air which provides 60 per cent of the heat and steel convector radiators set into the walls provide 40 per cent of the heat.

The teaching force at present consists of 20 full-time day teachers, plus 4 call or part-time teachers, 11 circuit teachers, and at present there are 64 call staff teachers employed in the evening school adult education courses.

Present-day enrollment this school year is 642 and evening school enrollment through November is 1269. The enrollment in the school for Licensed Attendants is 11 and in the University of Wisconsin Extension Division Center there were 131 enrolled for the first semester.

The over-all picture is very gratifying to the director, the board, and friends of our school within the city.

The Scottish Woollen Technical College

WILLIAM GARDNER
British Information Service
New York City

In Market Street, Galashiels, in the Scottish borderland with England, on the west bank of the Gala Water, stands a red stone building, bearing the date 1908. It is the Scottish Woollen Technical College. But the date indicates merely the birth year of the red building. The history of Scottish effort and endeavor for the improvement of its woolen industry goes back beyond that. In fact the present college developed from evening classes in cloth designing begun over 60 years ago. Even then the men of the woolen trade in the watershed of the Tweed recognized that to keep their fair name and high reputation for first class tweed they must keep on advancing.

The old evening classes grew rapidly from 1898, and by 1902 required premises of their own — rented — and larger premises — still rented — in 1905. Such growth and enthusiasm warranted the present buildings, completed in 1909, half the cost being paid by private subscriptions from woolen manufacturers and half by grant from the government, through the Scottish education department. In 1923, the college was reconstituted as a central institution conducted by an association registered as "The Scottish Woollen Technical College," being a joint stock company, not for profit and limited by guarantee.

The object of the association is the advancement of the woolen industry in Scotland, and the membership covers all districts in which the industry is carried on,

The Scottish Woollen Technical College, at Gallashiels, Scotland

— British official photograph, issued by the Central Office of Information, London

from Stornoway, in the Hebrides, and Elgin, Morayshire, in the north, to Langholm, in the south, only a few miles from the English border.

The governing body of the college consists of 20 members, 12 being elected by the association from its own number, including partners of firms and directors of joint stock company members, seven being nominated by the democratically elected county councils of Roxburgh, Selkirk, and Peebles, and one by the Senatus of Edinburgh University. The Scottish education department nominate an assessor.

How is the college run and financed? The educational and financial administration is in the hands of the governors, subject to the approval of the Scottish education department. All members of the association pay subscriptions proportional to each firm's wage bill, the rate being fixed at the annual meeting of the association. The present rate is four shillings (80c) per £100 ($400) wages. Further income is provided by students' fees, interest on an endowment fund, and various minor sources. The government makes a grant to meet college expenditure not met by the above income, and on an average the government and the other sources, each pay approximately half the cost of running the college.

The college caters to all classes and in normal times has about 20 full-time and 70 part-time students. The former, taking the full course of three years, come from all over Scotland and are usually employers' sons or county bursars. But since World War II there has been a change and among the present 120 full-time students are many ex-servicemen, fitting themselves for places in the peacetime woolen trade. There are now 50 part-time students attending under the scheme whereby employers allow them off work one day a week to study under the experts on the college staff.

But the fame of tweed has spread far and wide and not all the students are Scots. There has always been through the years a moderate proportion of students from abroad, and almost every country sent its quota before World War II. Now, Norwegian girls are back, finishing their training at Galashiels.

The day off a week for study developed from Saturday afternoon classes begun over 40 years ago, and for over 30 years most employers have granted part-time release for selected apprentices — a pioneer movement in Scotland. Specially chosen apprentices often attend the college for several days a week. These students are from all classes of society. The college is thoroughly democratic — the employer's son from Jedburgh or Cambridge sits side by side with the bright "laddie" who left school at 14 years of age. They run neck and neck for top places, with no favor on either side.

Another Scottish pioneer movement was the inauguration over 20 years ago of correspondence courses for students unable to go to Galashiels. These have met with great success.

As if to show that the Borderers did not mind sharing their college even with possible rivals in the Hebrides — the home of the famous Harris tweed — the Galashiels College in June, 1939, ran a successful course for teachers at Stornoway, in the Island of Lewis, but World War II and its aftermath have so far prevented its renewal.

The principal of the college, Dr. A. W. Stevenson, is an Edinburgh graduate in engineering whose practical experience included millwright work and factory planning, electrical driving of textile mills, aero-engine design and textile research. He has a staff of six, one in yarn manufacture, three in cloth manufacture, and two in dyeing and chemistry.

The college continues to look ahead and recently the governors submitted to the advisory council on education in Scotland — a government appointed body — two memorandums on the subject of technical training and its future development. One of the reports states that one of the college governors has for some time held the view that instead of engaging one person for a job, two would be engaged, each spending half the week at school and half in the mill.

Closely concerned with specialized education for those over 18 years of age, the governors also state in their reports to the advisory council that more skilled workmen and those from whom foremen would ultimately be drawn, will require further instruction. The best students would be able to get the London City and Guilds Full Technological Certificate or the Higher National Certificate when established for textiles in Scotland. Successful ones would get a certificate of apprenticeship giving status as a fully qualified craftsman.

For those going on to design, management, or dyeing, a full-time period would be desirable, reaching up to University standard in applied science and qualifying for the college diploma and A.T.I. (Associate of the Textile Institute). Affiliation to a university and the giving of a degree in textiles is at present under consideration.

Although the main work of the college is the provision of vocational training, further education training, and business training for employees in the woolen industry — and it gives two diplomas, one in wool manufacture and one in dyeing for the three years' courses — the college at Galashiels also seeks to serve its parent industry in a variety of ways.

It investigates manufacturing faults and difficulties, demonstrates and tests new machinery and trains operatives for it if need be; arranges special lectures, conferences, and discussions, and also educational tours abroad as well as in Scotland. In addition it plans to undertake psychological job analysis for all occupations in the industry — and there are in it some 15 apprenticeable trades — as a basis for vocational selection and training, also piecework prices, and to keep statistical records for the industry and carry out market investigations from the statistical point of view.

Despite its manifold activities the layout of the college buildings is comparatively simple. The main building is devoted to lecture rooms and laboratories for pattern analysis, textile testing, chemistry, and dyeing.

The machine shed has some 40 hand looms for experimental weaving, and units of the principal machines used in woolen mills on which the students can practice until they know all that is to be known of the machinery.

Hitherto the staff have been too busy to tackle large research problems, although they have contributed their due quota of minor *discoveries*. But now a branch laboratory of the Wool Industries Research Association has been established in the college building, and is closely linked with the general technical and laboratory courses given in the college.

Escola Tecnica de Aviacao

ALAN R. PAWELEK
Ball State Teachers College
Muncie, Ind.

Built on a plateau 2500 feet above sea level, 50 miles inland from the Atlantic Ocean, 180 air miles from Rio de Janeiro, surrounded by luxurious green hills and mountains, is the great industrial center of Brazil, the city of São Paulo. Famous in its own right as the only metropolis given over wholly to manufacturing in this great South American country, it can be compared quite favorably with Detroit, Mich., in population and industry but with no other similar city as to climate. Here, the crisp early morning and evening air with warm afternoons during all the seasons make living conditions ideal for all practical purposes. The inhabitants are a busy, hurrying, ambitious people, very different from those in other parts of Brazil where lower altitudes and tropical temperatures exist.

São Paulo has the largest construction rate of any center of population in the world, an average of one house every 16 minutes. Industrialized to an extent far greater than any other city in South America, the large, colorful parks with native flora, the terraced landscaping, and the beautiful, wide boulevards belie rapid growth and industrialization. At the same time there are modern paved highways, long, clean tunnels, graceful viaducts, and ultra-modern buildings of concrete with beautiful architectural designs. Man's white masterpieces of cement and stone set in a green ring of some of nature's greatest handwork, augmented by the Brazilian's aptitude for and love of decoration; this is São Paulo — one of the most beautiful and startling cities in the world.

Brazil, more so than other countries, is a melting pot for all nationalities. Since the days of the importation of the Negro as a slave (slavery was abolished in Brazil in 1888), there have been no disturbances because of color, creed, or racial differences. Brazil has never known the bloodshed of the purge, the racial riot, the class system, or the farcical assumption by some of having a better grade of "pure blood." There never has been a Brazilian master race. This social and political condition is due largely to the relatively sparse population with the consequent intermarriages between the natives, the Negroes, and the immigrants. Through hundreds of years there has been a racial assimilation which has produced an individual with practically no outstandng features that would characterize him as belonging to one definite color or race. Men are accepted into society regardless of background or ancestry. Brazil, in its futuristic, true social democracy has shown and will continue to show the world that if a policy of "laissez faire" is maintained toward its inhabitants, there is unlikely to be color or racial discrimination.

Although Spanish is spoken in the other South American countries, the language of Brazil is Portuguese due to its discovery and settlement by Portugal in the year 1500. As the English language grew in North America an analogous growth in Portuguese took place in Brazil. Understood and read by the people of both Portugal and Brazil, there are slight, subtle differences in the written and spoken tongues which would immediately characterize the inhabitant of either country. The educational pattern in the preparatory schools and colleges of Brazil has followed that of the Latins. The curriculums are largely classical and the language contains relatively few technical terms. However, an influx of North Americans since the start of World War II has brought a corresponding number of new words which have been adopted by the Brazilians. This nomenclature is easily recognizable even though spoken with the softer, more harmonious Portuguese pronunciation. For example (the natives say "por exemplo," pronounced poor-r-r ezemplo): Fuselagem (Foo-se-la'-gen), Cabine (Ca-bē-nē), and Piloto Automático (Pē-lo-to Ow-to-má-tē-ko).

The establishment of air bases by the Allies along her eastern coast at the start of World War II, brought to Brazil's consciousness the need for more trained men in the field of aviation. With the approval of General H. H. Arnold of the United States and under contract to the Brazilian Government, there arrived in São Paulo on the thirteenth day of November, 1943, a group of twenty American technicians dedicated to establishing a ground school of aviation to be called the Escola Tećnica de Aviaçao (Technical School of Aviation). Under the most difficult teaching conditions, against hardships only known to missionaries and pioneers of education, and with the added seemingly insurmountable barrier of demonstrating and lecturing in a

foreign tongue, this intrepid group succeeded insofar that on August 10, 1944, graduation exercises were held for the first class of students whom they had met shortly after their arrival. But since the first graduation, hundreds of men trained as specialists in their respective fields have passed and continue to pass through the portals of the "Escola." They go to the far-flung territories and states of Brazil to obtain more experience and to disseminate technical knowledge and materials to their countrymen who have not had an equal opportunity to study modern equipment, methods, and procedures. After a period of time at one of the various bases those specialists showing the most aptitude for their work and also a teaching ability are selected from their respective groups and returned to São Paulo as instructors. It is reasonable to assume that after a few years the Escola Tecnica de Aviacao will have a staff of Brazilian instructors fully capable, competent, and in sufficient numbers to carry on the task which was initiated by the North Americans. In this manner Brazil will always have a reservoir of her own men which can easily be shifted in the event of future expansion.

A copy, but on a larger scale, of the army ground schools formerly operated in the United States, the Escola Tecnica de Aviacao boasts a basic school with eight divisions and a specialist school of twenty departments. While in "basic" where he is placed upon matriculation, the "Aluno" (student) is given those fundamentals deemed necessary to every individual connected with aircraft mechanics. If these courses are completed satisfactorily, he is eligible to attend a specialist department where theory and practice are taught a sufficient number of hours to form a background enabling him to work at an air base or in combat areas. Upon graduation he is given the rank of "Terceiro Sargento" which is analogous to the United States Army's "buck sargeant."

For those who wish to compare the Escola Tecnica de Aviacao with schools in the United States, the following is a list of departments now functioning and the usual number of weeks allowed for classroom instruction and practice.

BASIC SCHOOL

Department	*Length of course in weeks*
Hand tools	3
Mathematics	2
Theory of flight	1
Blueprint reading	1
Physics	1
Electrical fundamentals	1
Theory of engines	1
Air force fundamentals	1
Total — 11 weeks	

SPECIALIST'S SCHOOL

Aircraft	28
Electricity	18
Radio communication	20
Radio maintenance	36
Air traffic control	24
Link	36
Parachutes	12
Sheet metal	36
Welding	20
Engines	22
Motor vehicles	18
Propellers	24
Hydraulics	16
Machine shop	27
Instruments	26
Weather forecasting	52
Aircraft woodworking	20
Air force administration	20
Radar	Not definite
Weather observation	Not definite

Besides the foregoing departments there is also a section of English in which the cadets receive one hour of instruction daily. During the time that English is being taught the American instructors attend a class in Portuguese. This arrangement not only gives the student an opportunity to study the language of his teachers but also gives the instructors a chance to further their knowledge of Portuguese. Attendance by the instructors is compulsory until he is able to pass a proficiency test which consists of written and oral examinations conducted by a committee of three Brazilians. Merit raises and promotions for the personnel are based to a great degree upon an ability to speak fluently in the native tongue. Thus a further bond of mutual understanding has been formed between the "Americanos" and the "Brazileiros" due to a knowledge of the difficulties which each encounters in the language of the other. This circumstance has led to the invention (in a good-humored and comical manner) of a new slang for the Brazilians. Generally speaking, all infinitives have an ending of "ar," "er," or "ir" in Portuguese, and since "Vamos" means "let us," expressions such as the following are heard daily: "vamos walk-ir," "vamos smoke-er," or "vamos just talk-ar."

Because of the great differences which exist in the education and backgrounds of the embryonic specialists a testing program has been instituted for their selection in any one of various departments. Native capacity, former education, mechanical ability and interests are taken into consideration before he is placed into a specialized course. After his matriculation is completed he is under military discipline and rule. He is in the Brazilian air force. If it so happens that his grades are low or his actions are not compatible with those of the military, he is "broken" and sent to one of the air bases as a private to do the necessary menial tasks. After a period of three months if his work warrants, he is given another chance to attend the "Escola." But, in all fairness to the men of Brazil, it can be stated that the percentage of "washouts" is extremely low — very much lower than would ordinarily be expected from a school of this size. The cadets, as a whole, are a pedagogue's dream of initiative, aggressiveness, ambition, courtesy, good behavior, and interest. The Brazilian student will sit for hours in the classroom gleaning every last possible bit of information and then asking for more; give him some practical work with tools and a piece of equipment and he will more than likely forget his "smoke period" or even his lunch! Truly these men are the epitome of a thirst for knowledge. Starved by a nationwide lack of mechanical and technical education, the cadets can be compared to the pupils in our junior high schools in their eagerness to learn and their curiosity about mechanical principles.

Another creditable group of which the school boasts is the instructors of the "Escola Tecnica de Aviacao." Although educational attainments range from high school graduation to the doctor of philosophy degree, the entire staff is composed of skilled technicians in some phase of aeronautics. Here again, there is a diversity of backgrounds: from the man who worked with Billy Mitchell at the beginning, to the young present-day aeronautical engineers. In the past quarter century of its phenomenal growth each of the steps taken by that young giant, aviation, has been made because of the assistance given in some degree by at least one member of the instructional staff. In general, the majority hold pilot's licenses, many have had ground crew, crew chief, or flying experience derived from actual participation in the war or an airway system, and all hold at least two C.A.A. ratings. Here is a staff of which any school of aeronautics could be justly proud.

For the diversion and enjoyment of the teaching staff during the evening hours and week ends, a fine recreational program has been instituted. Participation in sports such as tennis, swimming, volleyball, and basketball can be had for the asking at the Municipal Pacaembu Field House, which for its completeness, beauty, and utility, is second to none in the opinion of all who have seen it. A bowling tournament which offers interdepartmental competition is of a quasi-continuous type. Sunday trips to surrounding places of interest such as Santos, the world's largest exportation center of coffee, or Guaruja, a small city boasting a beach which rivals Rio's "Copacabana" in size and natural beauty, can be

taken in one of the school buses at no expense. A monthly party and dance is given for the American personnel and their friends at one of the better clubs of São Paulo. Thus it can be seen that all is not just routine and monotony in Brazil!

The manner in which the Brazilians have welcomed the North Americans into their country is little short of amazing. It is difficult to believe that the natives of any land would, with such evident sincerity, gather into their arms a literal horde of "estrangeiros." Inherently polite, courteous, and formal, the well-educated "Brazileiros" have at times, undoubtedly, been stretched almost to the breaking point with the "Americanos" informality. But adding greatly to their credit is the fact that although naturally dynamic, impetuous, and impatient, they have waited without undue rancor and have overlooked the many social faults and errors until that time when these, their neighbors from the North, had become better accustomed to their predominate habits, modes of living, and mores. On the credit side of the immigrants, a surprise was given to the majority of Brazilians who never entertained the thought that the Americans, with their supposedly superiority complexes, would ever attempt to learn the language of another country. But the "Yanks" with their universally known aggressiveness in accomplishing that which has to be done (and soon), stepped into the task and, which even the most doubtful have admitted, are doing a fine piece of work. Could there be a better good neighbor policy? One has to view the following examples which are only a very small number of those which have arisen in the past years between the citizens of these two great nations to know the answer. The ranking officer of the military administration declares an official holiday for the school and gives a dinner of turkey and "all the trimmings" to the North American personnel on Thanksgiving Day; their reciprocating through a Christmas ceremony and presenting handsome gifts to him and his aides; the intermarriages that are taking place; the many invitations to dinner, ceremonies, the theater and evenings at home, which are shuttling constantly between both nationalities — these are the concrete evidences of good relationships. Working, playing, and learning together — a mutual respect, understanding, and esteem is gained which never could be accomplished by propaganda or through governmental documentary agreements.

The Escola Tecnica de Aviacao, in its sphere of influence which has already encircled Brazil, is a functioning part of a good neighbor policy. The magnitude, scope, and educational ramifications of this enterprise cannot be overestimated. Truly a great innovation and undertaking, and certainly one of the best ambassadors of good will obtainable, it remains breathtaking in its possibilities. With the imagination fired, and not being too fantastic, one can see that in the future colleges and universities may be moved in their entirety to other countries with educational advantages less than those of the United States.

To Ex-President Vargas' great minister of aeronautics, Dr. Joaquim Pedro Salgado Filho, belongs the honor of initiating the action toward a technical aviation school in Brazil. Realizing that his country was in sore need of trained men and that its future would be dependent to a great extent upon aircraft transportation, he laid his plan before General H. H. Arnold of the United States Army Air Force and his own progressively minded President. Much to their credit in immediately seeing the value to both governments of such an idea, an agreement was reached by which John Paul Riddle[1] was given the task of instituting such a program. Already experienced in some of the problems and intricacies involved in this type of undertaking due to his huge ground school and seven connecting air fields in Florida, the necessary framework was not long in the building.

But this is only the beginning. Known possibilities exist and a pattern has been set, waiting for that time when more men and governments with forward vision, altruism, and enterprise will attempt to link the world more closely through the education instead of the destruction of its youth.

[1]Founder of the Embry-Riddle School of Aviation in Miami, Fla.

Education for democratic living involves a gradual transfer of contacts from external authority to inner checks. Pupil-teacher planning provides rich opportunities for testing individual and social judgments under mature guidance. — *From Teaching Progress, Milwaukee Public Schools.*

This picture, "Men of Destiny," taken by William G. Hanschmidt, Jr., Bexley High School student, Columbus, Ohio, was awarded a second prize of $50 in Class I – School Projects – in the third annual 1948 National High School Photographic Awards

Color Rendering

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Color rendering is the science of painting or coloring to further the morale and physical standards of the individual concerned. It is synonymous in meaning to "Color Conditioning," "Color Dynamics," and "Three Dimensional Seeing." The latter term is descriptive of its chief function, as it gives to an object not only width and height, but also depth. It involves rendering of color to high-light, reveal, and emphasize, rather than to camouflage and hide. Years ago very little if any thought was given to the relationship of color and light when factories or homes were painted. The lighting facilities were inadequate, which resulted in the misconceived idea of painting everything white to strengthen the morale of the individuals. The reverse was found to be true as the glaring, white surrounding proved to be very injurious to the eyes, thus causing fatigue and restlessness. The illuminating engineers of the Du Pont and Philadelphia Electric Companies as well as the Pittsburgh Plate Glass Company have spent several years in scientific research to utilize the energy of color to promote better relationship between labor and management. The camouflage effect created by the dark drab machinery is rapidly being replaced in industry as well as in our school shops by soft tones of contrasting differences.

The Transition

There are three definite steps involved in making the inexpensive transition. The first step is the *spotlighting* of working areas. This consists of separating the critical from the noncritical parts of the machine. The color combinations are selected to increase visibility by contrast. The critical parts of the machine are painted with a color known as a *focal* color. A *focal* color focuses the attention of the worker precisely where it should be. It minimizes the eye-wandering and the nervous tension which exists when the entire machine is painted a dull gray. The proper selection of a focal color depends on the color of the material being fabricated.

The second step, and equally important as the first, is that of painting the noncritical part of the machine a receding color, a color causing these parts to *drop back* just as a *focal* color causes the critical parts to *come forward*. Its main characteristic is that of having a relaxing effect upon the worker. One of the companies mentioned above recommends a *Vista Green* and the other two companies recommend a *Horizon Gray*. Both are excellent receding colors and are neither too light nor too dark to be easily soiled.

The third step in color rendering is that of finishing the walls and ceiling as well as the floors in soft tones to relieve eyestrain and assure uniformity of brightness throughout the field of the worker's vision. The selection of color depends on the amount and source of light in the shop, the directional exposure as to whether the shop is on the north, south, east, or west side of the building, and the individual desire for certain colors.

The Results of Color Rendering

Selecting the right hue, with the proper value and chroma gives excellent results to color rendering:

1. Reduces eyestrain.

Light traveling at the rate of 186,000 miles per second creates a tremendous shock upon the eyes of the worker if when raising his eyes from his work, they would have to adjust themselves to the difference in illumination caused by a glaring, white wall. The correct choice of color eliminates severe contrasts and glare which would slow the worker's physical and mental processes.

2. Fatigue is minimized.

If eyestrain is reduced, fatigue is automatically reduced.

3. Improved lighting.

Much thought and foresight must be exercised to scientifically select a light-reflecting rather than light-absorbing color. As much as 100 per cent more illumination can be obtained without changing the lighting equipment. Therefore, a properly selected color scheme affects illumination by diffusion, reflection, and conservation.

4. Improved appearance.

"Clean Up and Paint Up" is a much-heard-of slogan which when properly carried out makes a better-appearing shop, home, and community.

5. Reduces maintenance costs.

The operator develops a sense of ownership in his machine and takes great pride in its upkeep.

6. Aids in "housekeeping."

The foremen or shop supervisor can quickly see whether or not the shop and the machines are in a *spic and span* condition. It is easy to keep a neat-appearing shop in order.

7. Improved worker morale.

It has long been recognized that color has a marked influence on the morale of the individual. Drab, cheerless surroundings result in mental depression among the employees as well as among the students in training. The difficulty of the job is in direct proportion to the mental strain.

8. Improved health conditions.

Eye fatigue communicates itself to other parts of the body which may result in nervous headaches, indigestion, and other bodily disturbances. Absenteeism is reduced to a minimum. Color punches the time clock.

9. Increases the quality and quantity of production.

Flaws and errors in fabrication are greatly reduced. It had been the practice in the past to paint machines gray and much the same gray as the material being fabricated. The workman was subject to severe strain upon the eyes and nerves to distinguish between the machine and the metal upon which he worked. It is known that under normal conditions it requires 2100 foot-candles to see black thread on black cloth, but a piece of white thread on black cloth requires only one-foot candle for the same visibility.

10. Personal injuries are reduced.

Contrasting working areas and *spotlighting* machine parts greatly increases the safety standards of the shop.

Color rendering is equally important in the home. It is known that certain colors will cause a room to look smaller while others make it look larger. Proper selection of color will give your home greater charm and beauty and will make it more livable.

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Teachers always have been foremost in realizing their responsibilities to their students, their community, and their country. That's why so many of them believe in the School Savings Program as a means of teaching thrift and good citizenship.

High School Building Trades Projects

WALTER E. DURBAHN
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Supervisor, Apprenticeship Training
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There are many causes for the present-day housing shortage, but one of the chief of these is labor — the critical lack of skilled building mechanics. We in vocational education are, or should be, vitally concerned with this phase of the problem.

The need of building mechanics has kept old men on the job who should or will be retired shortly. The war brought all shades of mechanics into the building field, attracted to a great extent by high wages. The emergency has necessitated tolerating the lack of skill and knowledge that they brought with them and many of them will undoubtedly fall by the wayside unless they receive additional training. Here is a rich field for vocational education. Fortunately, apprentice training in all of the trades is at present growing by leaps and bounds. At the Highland Park High School in September, 1946, we had 22 carpenter apprentices in training, 51 in September, 1947, and today we have 75 apprentices and several on the waiting list for the second semester. This is another field where vocational education can make a noble contribution.

High school building trades carries with it many educational implications both general and specific. Its guidance and social values give it a place in our general education which we in vocational work should never lose sight of. Its specific training, the practical experience, is derived through working with the tools of the trade, in the erection of a building, thereby developing the skills, knowledge, and understanding necessary to enter any one of the building trades advantageously.

One of the problems which confronts school administrators, directors, and instructors of vocational education is the organization and methods of procedure in developing a building trades program in the high school. Situations are so variable throughout the country that it would be impractical to think of only one method of procedure. One can only suggest the important factors and certain methods of approach, but it still remains for the individual to adapt them to his own school and community.

The great variation of programs was clearly demonstrated at the building trades summer workshop conference which the Illinois state vocational department has sponsored during the past two summers. These conferences were initiated by Ernest Simon, state director; organized by Edward M. Claude, chief of trade and industrial education; and directed by Richard L. Ready, a former building trades instructor, and now supervisor of trade and industrial education. Twenty-four out of 28 building trades instructors in the state met in the summer of 1947 and 33 out of 39 met in 1948 for two weeks at the University of Illinois in Champaign. What made it so valuable was the fact that here was a group of teachers in the same subject matter field with similar problems, living, eating, and working in the same building for two weeks on improving the building-trades program for our own communities as well as for all over the state. We got acquainted with each other; then went to work to build a

OBJECTIVES

General

1. To prepare the boy for advantageous entrance in the building trades

Specific

1. To orient students in the basic building trades
2. To develop skills and knowledge through practical construction
3. To develop appropriate and safe work habits
4. To develop the ability to apply technical and related information
5. To develop a wholesome understanding of trade and social problems

STANDARDS FOR BUILDING TRADES PROGRAMS

1. Students shall be at least 16 years of age and have junior standing.
2. Students shall enroll with the intention of completing two years of building trades.
3. Students shall enroll with the intention of entering the trade.
4. It is recommended that all enrollees in building trades have at least one year of previous industrial arts on an exploratory basis.
5. A building project equivalent to a two-bedroom residence shall be constructed as a vehicle for instruction.
6. With a one-half day program, it is better to spend two years on one project than to sacrifice on giving all the necessary technical and related information.
7. Classes shall be limited to 16 students.

Chart I

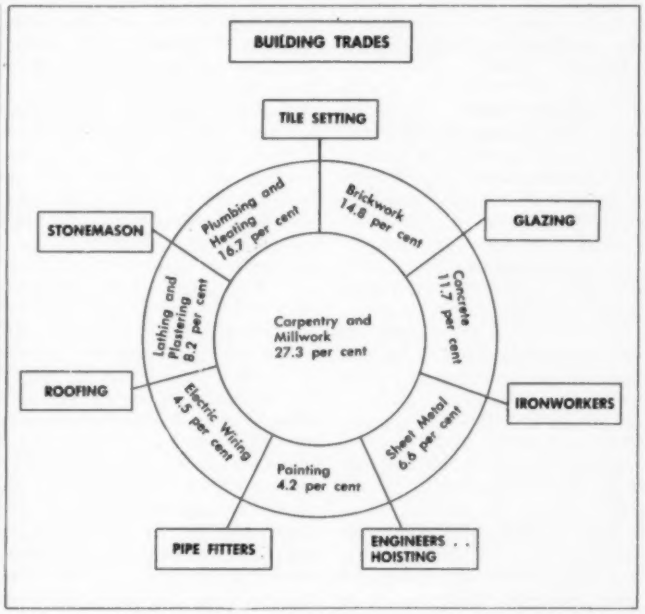


Chart II

program and instructional material which will be an aid to all of us. The work was done in committee meetings and then presented to the entire group who delighted in breaking it up, down, and adding to it. Building trades was not the only group that met in this manner. Other homogeneous groups in other subjects also met in the same way both summers. This type of teacher education should be encouraged throughout the country as it will do much to upgrade our profession.

The first thing to consider is the type of building-trades program best suited for our own school or community. There are two types and both come within the scope of the various vocational acts — the *unit trade* and the *general industrial*. The unit trade program is usually carried on in the larger schools where enrollment justifies the organization of classes in each or several of the building trades such as carpentry, plumbing, sheet metal, masonry, etc. In a small school the main trade would most likely be carpentry. This is because of the woodwork background most students have and because carpentry is the main trade in the erection of a house. Other tradesmen would then be brought into the picture to carry on the other trades.

The general-industrial program is designed for smaller schools where one instructor is responsible for all trades. The instructor becomes, or is a Jack-of-all-trades, and he must be a *master* of at least one. Since we have so many small schools, it is well that we place the major emphasis upon this type of building-trades program in this article.

Fixed Points

Because of the building shortage everywhere it is hardly necessary to make a survey of community needs. Give it some thought, however. Before starting out on any program it is well to chart the course, to have a plan. Some call it the objectives, others a philosophy, but call it what you may, they really are fixed points or goals toward which to strive.

Here are a set of fixed points developed during the summer conference by the Illinois building trades instructors:

Objectives

A. General

1. To prepare the boy for advantageous entrance into the building trades.

B. Specific

1. To orient students in the basic building trades.
2. To develop skills and knowledge through practical construction.
3. To develop appropriate and safe work habits.
4. To develop the ability to apply technical related information.
5. To develop a wholesome understanding of trade and social problems.

In order that we may better meet these objectives we set up certain standards:

Standards for Building-Trades Programs

1. Students shall be at least 16 years of age and have junior standing in high school.
2. Students shall enroll with the intention of completing two years of a building-trades course.
3. Students shall enroll with the intention of entering the trade.
4. It is recommended that all enrollees in building trades have at least one year of previous industrial arts on an exploratory basis.
5. A building project equivalent to a two-bedroom residence shall be constructed as a vehicle for instruction.
6. With a one-half day program, it is better to spend two years on one project than to sacrifice giving necessary technical related information.
7. Classes shall be limited to 16 students.

The Building-Trades Project

The ideal project is the building of a two-bedroom house, a dwelling of about 15,000 to 20,000 cubic feet. This is item No. 5 in the standards just set up. A house or building larger than this can become trying to both students and teacher. It does not permit sufficient time for related and technical information. It is just plain work, day after day. We have had experience with many different types and kinds of buildings at Highland Park: eight houses ranging in size from 15,000 to 33,000 cubic feet, two of them having 2½ baths each; and four buildings, erected for the school, ranging in size from 40,000 to 156,000 cubic feet. My advice is to stay away from the latter type of building program. It may discourage rather than encourage a student to enter the trade. An example was our auto shop which we built in 1928, a brick structure with 80,000 bricks. The students laid all but the first 20,000 face brick and out of 36 students in the two classes only two ever followed the bricklaying trade. What is needed is a project with a variety of trade experience and not too much of any one kind. This then makes the small home a more ideal project. The dwelling may be a single story, story and a half, or a two story; the closer one can stay to the ground the less hazardous it becomes. One should select a house plan that will require the use of many different types of materials and a variety of construction methods. The frame house with shingle and siding exterior wall covering and possibly asphalt slate roof shingle is good. A full or even a partial basement will provide concrete form construction experience which today can almost be considered a trade in itself. Plastering still is extensively used in the better grade houses. Even if the students do not do this work, they at least do the lathing — both metal and rock lath. Some schools have the students do the plastering. We have never attempted it at Highland Park, but we shall try it in the basement recreation room on this year's project. Plastering is a trade where you either know how or you do not. There is little opportunity to do it over or patch it when once it is on the wall, and it has to be good because it forms the interior finish. Dry wall construction is rapidly coming into the picture and therefore it would be well to finish at least one room in wood paneling and another in sheet rock or other type of wall covering.

Many states require a licensed plumber and electrician to do the work. This does not necessarily mean that they must do all the work, but they should at least supervise it. Where such requirements must be met, a journeyman is brought in, and he becomes the teacher while the instructor in charge becomes the supervisor and aids the tradesman in organizing the teaching of the work.

Warm air heating lends itself better than hot water or steam from the educational standpoint. Mechanical drawing is a part of the course, and most students should have had a basic drawing course before entering the trade course. Therefore, it becomes an easy matter to add such necessary sheet metal layout as may be required for a small home heating plant. An outlay of a few hundred dollars will set up a shop with necessary small tools and machines to do not only the heating metalwork but also other metalwork about the house.

The millwork for a house can be done by students if shop facilities and time are available. In the case of our own vocational building, Sandwick Hall, we did all of our own millwork except the outside sash. For the small home it would be entirely possible to have the students make the window and door frames, the jambs, kitchen cabinets, and other cabinets, and even the stairs, contracting for such items as sash, doors, and interior trim (casings).

Painting and decorating like that of plastering forms the interior finish and must be done with care. The average student can soon learn to do an acceptable job, but it requires considerable supervision. It, therefore, might be advisable to bring in a journeyman to supervise at least the last or final coat.

Other Forms of Building-Trades Projects

Some schools undertake the building of small farm buildings, garages, do jobbing, or just repair work about the school. This should be discouraged because it will not give the variety of trade experience. Then, too, it is quite easy to run out of work and then, for the want of a project, the course may revert to the old-fashioned manual training.

Some schools have the facilities to erect a house within the shop and then move it to the location. This becomes an all-weather job which is not exactly what the boy will find when he gets out in the trade. Others erect a small building within the shop and then tear it down, pull out the nails, and have the next class start all over again with the used lumber. I have never tried it, but I should think that this method lacks the incentive to do good work. It is normal to be more interested in creating rather than tearing down. This method may serve well for the carpentry trade but will eliminate many of the other trades.

Financing

Our experience has taught us that the best approach to the finance problem is for the board to buy a lot and then, after the house has been completed, sell it to the highest bidder. The bidding can be either by open auction or by sealed bids. In either case a minimum should be established covering the cost of the lot, materials, and extra labor. The open auction probably would prove most desirable. The sale can be turned over to the local board of real estate dealers or handled directly by the board.

Twenty-three years ago when we started our program, boards of education in Illinois were not permitted to buy and sell property. This legal angle was handled by setting up a trust agreement with a local bank and signed by three members of the board as individuals. The bank transacted the business of buying and selling. Recent legislation in Illinois has made it possible for boards to legally transact such business.

Originally our board set up a $1,000 revolving fund out of which certain labor and other incidental expenditures were paid. This fund was reimbursed upon the sale of the house. All other materials and labor were contracted for with an understanding that bills would be paid when the house was sold or within 12 months. The picture has changed. Today it is necessary for the board to finance the entire cost which of course will be repaid to public funds subsequent to the sale of the house.

Another method of financing is to build for an owner who will furnish the lot, materials, and cost of any extra labor. Two of our houses were financed in this manner during 1933 and 1934. This, however, caused considerable opposition from labor and almost resulted in the closing of the department and riding the author out of town on a rail. Labor did finally agree that as long as the school owned the property and auctioned the house after completion, they would go along with us.

Approval

With objectives and standards developed, and knowing the type of program and the method of finance, it next becomes necessary to get approval from the administration and the board who will provide the necessary facilities. Together with this, one should also get the blessing of labor and employers. This can best be done by establishing an advisory council on which the various trades, as well as management, is represented. It is through this council that labor and employers can be informed. When properly informed, it is usually to obtain the co-operation and help to make the venture a success. Information and help for the organization of this advisory council can be had from the various state vocational departments.

Where it is impossible to establish a council, one should make it a point to contact key men in each trade as well as management to get their co-operation. The importance of establishing good public relationships cannot be overemphasized. Bear in mind that the intent back of this program is the successful placement of the graduates in the trade as apprentices or helpers. If labor and management have a part in its development they also will assume placement responsibilities. Business at present is booming and you may find it difficult to enlist their co-operation. Nevertheless, it is well to spend some time with them just to inform them. Times do change, however, and they may become more critical of a house building project under different conditions.

Instructor

The ideal instructor is one who has served his apprenticeship, has worked as a journeyman, and has gone through a teacher-training program, but such men are rare indeed. Well then, should he be a tradesman whom we will train to teach, or should he be a graduate from our industrial-education training institutions who can be trained to be a tradesman? One thing is certain, however, the building-trades instructor must be, or soon become, a tradesman, one who has not just worked *at* the trade, but *in* the trade *in competition* with other journeymen in his trade, who has endured some of their hardships and problems, eaten his lunch with them, and can understand their language. The teacher should be a master in one trade and have a fair understanding of some of the other trades. It is well to consider the avocational pursuits of the applicant. Does the institutionally trained man work in the trade during his free time, or is he doing any kind of work just to earn some money? Has the journeyman an interest in teaching the apprentice who is working on the job with him, and has he attempted to improve himself through reading, or by attending training classes during his free time? These are important things to consider in making a teacher selection.

According to the U. S. Bureau of Labor statistics, carpentry is the major trade in house building. When the entire field of construction is taken into consideration, including all the reinforced concrete work, the bureau finds that carpenters constitute the largest occupational group, accounting for somewhat less than half of the skilled group. This would indicate that it would be desirable, but not entirely necessary, that the instructor be a carpenter by trade.

Class Organization

The time element plays an important part in a house building project. The building-trades instructor in many of the smaller schools is also the industrial-arts instructor. He, therefore, spends half of his day in each phase of industrial education. In the larger schools he devotes his entire time on the project, having one class in the morning and another in the afternoon. Each student will in either case spend only one half of his school day, three clock hours, on the job and the other half on his academic work. Our standards, item No. 6, recommend, in the case of a half day program, that two years be allowed in the erection of a building. My personal opinion is that every building project should be extended over a two-year period. The erection of a building each year requires considerable pushing to have it under cover before cold weather in the northern climates, and to get it ready for sale by the end of the school year. In so doing too little time is available for related and technical instruction. Time also does not permit giving each student basic instruction, or a sampling in each of the trades represented on the building. This results in the skilled work going only to those interested and able to perform. Let us not forget that we are an educational institution and it is our duty to build the boys — every boy. The house is only a means to an end. Let's make it a real educational project.

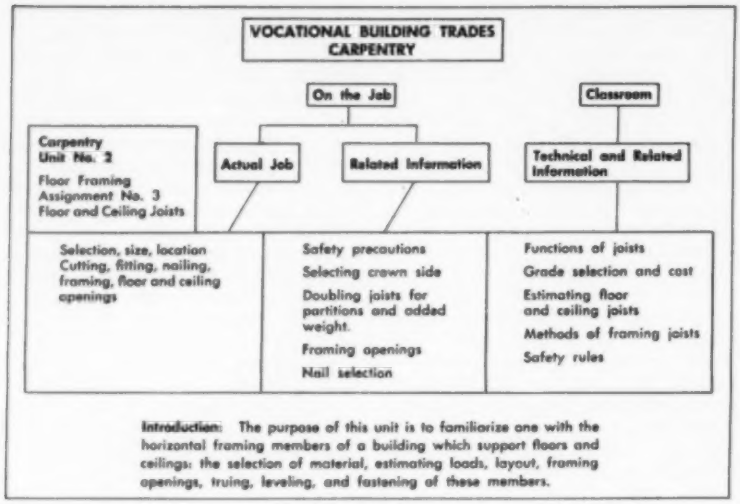

VOCATIONAL BUILDING TRADES
CARPENTRY
On the Job
Classroom
Carpentry
Unit No. 2
Floor Framing
Assignment No. 3
Floor and Ceiling Joists
Actual Job
Related Information
Technical and Related Information
Selection, size, location
Cutting, fitting, nailing, framing, floor and ceiling openings
Safety precautions
Selecting crown side
Doubling joists for partitions and added weight.
Framing openings
Nail selection
Functions of joists
Grade selection and cost
Estimating floor and ceiling joists
Methods of framing joists
Safety rules
Introduction: The purpose of this unit is to familiarize one with the horizontal framing members of a building which support floors and ceilings: the selection of material, estimating loads, layout, framing openings, truing, leveling, and fastening of these members.

Chart III

A two-year program is, therefore, to be recommended where three fourths of the first year's time is devoted to getting an over-all view, studying building codes, making a lot survey, and making a layout. A background of understanding of the entire project should be built up. Part of this period should be given to basic courses in those trades or areas not touched upon by the industrial arts. This will acquaint every student in the class with the tools, materials, and basic operations or processes of those trades. These are really short laboratory courses and can be used to advantage by making certain parts of the house such as window frames, cabinets and other millwork, sheet-metal fittings for the heating plant, casting of sills and lintels, and ornamental stones where masonry forms part of the exterior covering. This will help to screen the student's interests and abilities, and to facilitate matters when it comes to the construction of the building. At Highland Park we offer short units in concrete and brickwork, sheet metal, millwork, and painting.

The question of the basic course prior to construction is quite controversial. The theorists will claim that such information and experience should come at the time it is needed on the job. This would be quite ideal. But, if you have ever worked on a construction job, you will readily agree that it would be quite impossible to do this, and furthermore, not every student would be getting it.

The foundation or basement is built the last quarter of the first year. Being of masonry construction, it can stand during the summer months without too much deterioration, and the investment is not too great to carry over the vacation period. The foundation work completed in the spring will give a nine weeks' start on the erection of the house the following year. This will permit more time for related and technical information during construction.

There is a danger in such a program where the greater part of the first year is devoted principally to preparation that it may become just another shop class where students make things for themselves. However, with careful organization and conscientious administration, together with adequate instructional material and with the house as a goal constantly before the class, it can become a real educational factor in any building-trades program.

Facilities and Equipment

One thing in favor of a building-trades program is that it can be started with a small outlay for equipment. We started out in 1925 with $275 worth of hand tools. For five years the building under construction was our shop because nothing else was available. We then built a portable shop which was moved from job to job in which we kept tools, machines, clothes' lockers, and a workbench. In 1940 we completed our own shop, Sandwick Hall, in which we now have 5300 square feet of floor space with six well-equipped trade areas — millwork, sheet metal, electricity, concrete, and brickwork, painting, and plumbing. This now makes it possible to carry on a two-year program with its preparatory phase, and a shop out of which to work when doing construction work. It also provides shop facilities to carry on our apprentice and journeyman training which should become a part of every building-trades program.

A shop area as large as ours is not absolutely necessary, especially for the half-day programs where the instructor already has an industrial-arts shop. If another room can be made available, where masonry, sheet metal, plumbing, etc., can be carried on to give basic preparation in these trades, it would make quite a desirable setup.

Related Instruction

The *related instruction* phase of the program has been left until the last because it undoubtedly is the weakest part of any vocational program, especially in the building trades. Vocational teachers, as a whole, are doing a pretty good job in teaching the manipulative skills, but the related information also is important and deserves more attention than it is getting now. Surely, it is not the lack of such informational material, because we have mountains of it. Our teacher-training institutions certainly are giving emphasis to it even more than to the tool skills. There may be several reasons for neglecting to give sufficient instruction in related information. The first may be the time element. We may be more concerned about getting that house completed by the end of the school year than we are about enriching the boy's experience with the information so valuable to his becoming a well-read and skilled craftsman. Another reason may be the organization of the material and the problem of co-ordinating it with the job at the time it is most needed. The lack of interest on the part of the average student to acquire this information is another. You may well recall those long, drawn-out "Oh's" when you bring out a book at just about the time they are ready to leave for the job or go to work at a machine. Then, too, it is an effort on their part to gracefully accept an assignment for homework. These, together with possibly some others, may be the reasons why we do not get more related information into our courses.

Teaching Related Information

We must bear in mind that a vocational student spends one half of his day on the job and the other half in the classroom on academic work related or otherwise. We also must remember that we have two types of related or technical information; the classroom variety which aims to relate the mathematics, English, social sciences, drawing, and physical sciences to the trade as well as to broaden the students' horizons. The other type of information pertains

HOUSE CARPENTRY

MAIN DIVISIONS	PROCESSES	THINGS TO TEACH
Floor Framing	Sill Construction	1. Local regulations, safety planning 2. Planning operation procedure 3. Estimating 4. Types of sill construction Methods of laying out and installing a) T sill b) Balloon frame sill c) Box sill d) Braced frame sill 5. Termite control
	Setting Posts, Girders, or Beams	1. Size, spacing, and construction of posts, girders, or beams
	Setting Floor Joists	1. Laying out joist spacing on sills and girders 2. Cutting, fitting, and nailing floor and ceiling joists

Chart IV

BUILDING TRADES CARPENTRY

References:

1. Delmar — **Framing, Sheathing, and Insulation**, pp. 43–52.
2. Durbahn — **Carpentry**, Vol. II, pp. 50–66.
3. Lair — **Carpentry for Building Trades**, pp. 13–18.

Checking Your Knowledge:

(The circled number refers to the corresponding reference numbers.)

(3) pp. 14. A. Joists are generally spaced .... inches apart on center.

(2) pp. 61. B. The minimum span for 2"x 10" joist, 12" O.C. with 40-lb. live load and plastered ceiling is .....

(1) pp. 44. C. The .... edge of a joist should always be up when placed in position.

(2) pp. 63. D. In fitting joists around steel beams allowance must be made for ....

Chart V

directly to the job which is about to be done. It is information necessary to do the work and should be given on the job right in connection with the work.

It was the original intent of the Smith Hughes Act and it probably still is the intent to have the academic work taught by a related subjects instructor, and that the content of the courses be directly related to the trade. No doubt, the student will become better prepared for the trade with this method. But, unfortunately, it may isolate the vocational students from the rest of the high school group. This is especially true in schools where the major emphasis is placed upon college preparatory. We operated on this basis for twenty years before a change was made. Today our vocational students take their English and social studies with the rest of the high school students, are spread into various home rooms, and participate in the regular physical education program. We do, however, still retain a related science, mathematics, and drawing instructor who meets with the students for seven periods a week. This instructor does not only teach these subjects but also aims to show the relationship of these subjects to the trade by making direct application — something which the average academic teacher usually fails to do. Much can be said in favor of this approach to the technical information. It is necessary, however, that the instructor have a trade background and be a specialist in the academic subjects, besides having a real desire to co-ordinate his work with that of the shop instructor.

Some schools have their vocational program organized so that the students will spend half a day in vocational work and the other half in regular high school academic classes where no particular effort is made to co-ordinate the contents with the construction work. This second method would then require the shop teacher to give the necessary technical related information during the three-hour shop period. Such a procedure will shorten the working time on the job but it may effect a better co-ordination because it is handled by the same teacher.

The trend toward college entrance has increased in recent years, and many capable students have avoided vocational work because it would jeopardize their chances of getting into college. This can be overcome by organizing the curriculum so that the first two years in high school will be college preparatory. Then, if to this is added the American history course and another year in English, it still will permit a class in related trade instruction as well as a half day vocational course during the junior and senior year.

The organization of the related material has always been a problem for building-trades teachers. It still has not been entirely solved but some very worth-while steps have been taken. The trade analysis, one phase illustrated by the chart III of the six major trades made at the summer conference has been of tremendous value, chiefly to those who participated. Its simple but effective approach, by listing the main divisions, processes, and the things to teach, will be a guide for any building-trades instructor.

Trade analyses are fine but they do not go far enough; we must have something more to work with. The assignment sheet does this. Chart IV is a guide to insure coverage of a particular phase of work. This example of an assignment used by the instructor has a suggested introduction on which the teacher can elaborate. It also indicates the related information necessary for him to give to a particular job. Now then, if to do this he adds a demonstration of how the job is done, the student can proceed to get the work finished. However, if we are going to do a real job of trade teaching, we must go one step further. We must bring into that classroom technical related information, that something which is not essential to do the job, but most desirable if you are to produce a well-prepared skilled mechanic. It is that something which will enrich his training and help him to bridge the gap between the academic and the practical. Through this we will acquaint him with books and literature so that in later years he will be able to reteach himself or search out new knowledge. The last chart, V, is an example of the student's assignment. It must be short if we are to keep his interest and not consume too much time. Similar assignments were worked out at the conference for all phases of the six major building trades and they form quite a sizable volume.

Our system of free enterprise is not a perfect system. But I defy anyone to discover any other system that stands even shoulder-high with it. Despite its faults, America, because of its free enterprise system, is the only country in a secure position in this tottering world. — *Capt. Eddie Rickenbacker.*

Teachers and school administrators who carry on the School Savings Program are members of an important group which will be honored for volunteer service on Patriot's Day, April 19.

Small Schools Can Offer a Practical Course in Carpentry

HAROLD C. MATSON
Director, Industrial Arts and Vocational Education Drafting
Albert Lea, Minn.

Everyone connected with industrial arts and vocational education is interested in the housing situation both present and future. Naturally those of us in this field of work are aware of the importance of training prospective carpenters.

We in Albert Lea (population approximately 15,000) have a broad industrial-arts program, but heretofore the vocational or trade training program was limited to a course in machine shop.

In the spring of 1947 School Superintendent J. John Halverson and I discussed the feasibility of offering a course in carpentry. We decided that the best practical training would be to actually build a house. S. K. Wick, state supervisor of trade and industrial education, approved of offering this course under the Smith Hughes program. The school board agreed and announced the plan was open to prospective home builders. The boys would work three hours per day five days a week for 36 weeks. Completion of the course would earn two high school credits.

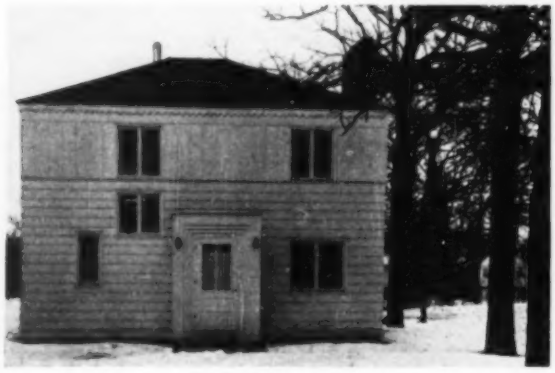
Besides an interest in the course the only prerequisite was the successful completion of one year in advanced woodwork. S. F. Schwartz, our advanced woodworking instructor, also a qualified Smith Hughes carpentry instructor, was selected to teach this course.

Beginning of the 1947–48 project

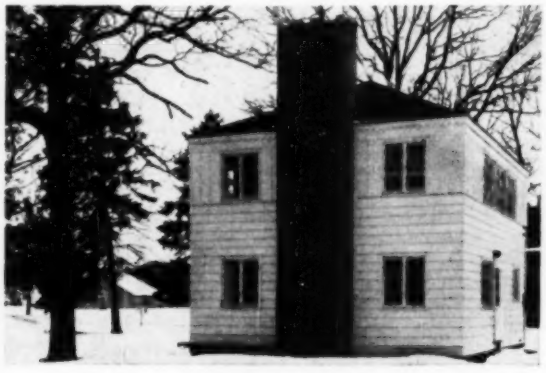
A retired teacher accepted the school's proposition and the foundation was laid in September, 1947, just before the opening of school. Under the terms of the agreement the owner was to have the foundation in and ready for the actual construction work by September 1. He also must supply all materials. The students do only the carpentry work, all other tasks such as wiring, plastering, bricklaying, and plumbing are arranged for by the owner. The owner also must take out public liability insurance in limits of $10,000 and $20,000 to protect himself against any claims that might be asserted against him on account of any accident occurring as a result of this project. The agreement shall terminate at the close of the 1947–48 school year and neither party shall be under any obligation to the other. (Copy of agreement at end of article.) The home constructed was a 2-story, 6-room home of French Colonial design having two bathrooms, and a recreation room in the basement.

Since this is a Smith Hughes course aided by the federal and state governments, a local advisory committee consisting of representatives of industry, business, and labor was appointed. They visited the project several times and were unanimous in their approval of the work being done. At a meeting the following spring they were in favor of continuing the course for another year. State officials also visited the project during the year and expressed their satisfaction. Between 40 and 50 members of the Southeastern Minnesota Industrial Arts Association inspected the house and were surprised at the good workmanship. Eight out of the nine boys who completed the course are now working in carpentry and construction work.

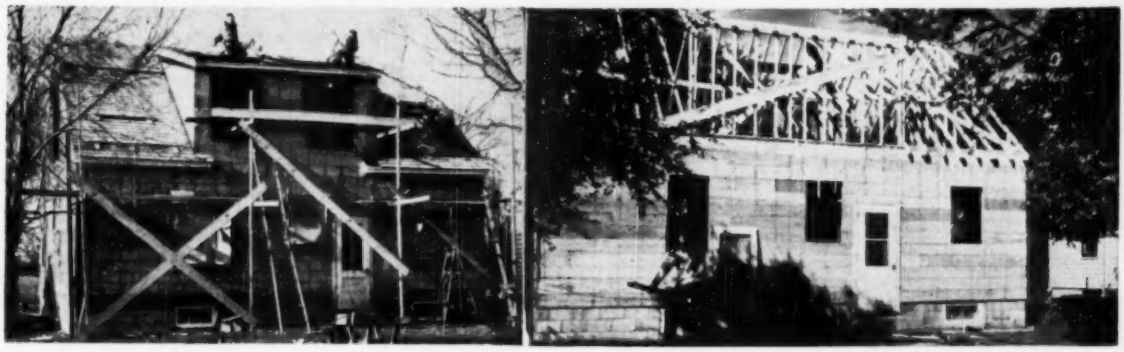
This school year 1948 and 1949 the carpentry class is again building a 6-room house. A second prerequsite has been added however; a student wishing to enroll in the course now must have earned a credit in both advanced woodwork and architectural drawing. We have found that those students with a year of architectural drawing understood and adapted themselves much more readily to the various phases of construction. Class enrollment is limited to ten



1947–1948 project



1947–1948 project



The 1948–49 project at Albert Lea, Minn.

students so that each receives an adequate amount of individual instruction and supervision.

I admit that the idea of a house built by students is not uncommon. Especially is this true in larger cities with their vocational schools. I do believe our plan is unique in that the students do only the construction or carpentry work, thereby eliminating many problems connected with the other phases of home building. Therefore this plan could be successfully carried out by many smaller schools who do not have the various trade classes to do the necessary plumbing, wiring, plastering, brickwork.

These boys will be trained in a trade with excellent prospects for a bright future. Employment conditions are very favorable for *good* carpenters and should remain so for many years.

A copy of the agreement between owner and the school board follows.

Agreement

This agreement made and entered into this twenty-fifth day of April, 1947, by and between Albert Lea Special School District Number Thirty-eight hereinafter referred to as the school and John Doe hereinafter referred to as the owner.

Witnesseth, the owner is interested in building a home in the city of Albert Lea and the school is interested in having a practical project on which to work for its carpentry class.

Now Therefore, in consideration of the premises and the respective covenants of the parties, it is hereby agreed as follows:

The owner will purchase a lot in the city of Albert Lea and attend to having the excavation of the basement completed and a foundation erected by September 1, 1947. He will furnish all building materials in connection with the erection and building of said house and shall be personally responsible for the plastering, wiring, plumbing, heating, and the brickwork and masonry.

The school agrees to have its carpentry class under the direction of S. F. Schwartz to perform the carpentry labor necessary for the construction of a frame house and garage, said work to commence with the opening of the school season for the year 1947–48.

Owner also agrees to provide heat in the structure so as to maintain a reasonable working temperature during the winter months. He shall have the privilege of choosing the materials to be used and shall furnish them as they become obtainable. He shall also have the right to have any work done over if same is not completed satisfactorily to him, the expense of materials, however, to be paid for by him.

It is specifically understood that the owner shall be under no obligation whatsoever to compensate the said S. F. Schwartz or any of the members of the carpentry class or the school for any work done on his property and it is also specifically understood that the said S. F. Schwartz or any members of the carpentry class or the school shall have no claim whatsoever to said property or any improvements made thereon.

Owner agrees to take out public liability insurance in connection with this project in limits of ten and twenty thousand dollars to protect himself against any claims that might be asserted against him on account of any accident occurring as a result of this project.

This agreement shall terminate at the close of the 1947–48 school year and neither party shall be under any obligation to the other on this project after said date.

In Witness Whereof, the parties have hereunto set their hands the day and year first above written.

Albert Lea Special School District Number 38

By .....

Title .....

.....

Title .....

.....

Owner

Course Outline For Related Subjects in Plumbing and Steam Fitting

CARLTON DWIGHT
Principal, Vocational School
Binghamton, N. Y.

(Continued from page 263 of the September, 1948, issue)

Course: Steam and Hot Water Heating Systems Installation

Steam and hot water heating systems installation

A. Trade science

1. Heating principles — sensation of heat, measurement of heat, quantity of heat — B.T.U., radiant heat, quality of heat, transference of heat, conduction, convection, radiation, evolution of heating apparatus
2. Types of radiation — direct cast iron, indirect cast iron, convector cast iron, unit heater, vento and blast heaters (Airfin), effects of bronzes and other coatings on radiating surfaces
3. Low pressure steam heat (one, two,

and three boosters) — low pressure one-pipe stream, low pressure two-pipe stream (trap system), return trap, condensation pump, vacuum pump, wet and dry return, Hartford loop, low eater cutoff, automatic boiler feed, water column, fusible plugs, safety valve

4. Hot water heating — 1-pipe overhead system, 2-pipe overhead system, 2-pipe basement main, D.T. pressure system, circulation — open and closed system, 1- and 2-pipe systems, balance system of hot water (first supply and last return), controls — construction and operation.
5. Central steam hookup
   a) Method of utilizing L.T.W. in condensation before discharging to sewer
   b) Condensate meters — types and operation
   c) Steamflow meters — types and operation
   d) Steam temperature control systems
6. High-pressure steam layout
   a) Standard and E.H. flanged fittings and their dimensions
   b) Pressure radiator valves and by-pass
   c) Pop valve and steam gauge
   d) Water column
   e) Steam driver vacuum pumps and governors
   f) Lubricators
   g) Boiler feed pumps
      1) Simplex
      2) Duplex
   h) Feed water regulators
   i) Injectors
   j) Exhaust steam for heating
   k) High-pressure steam traps
   l) Low-pressure valve
   m) Flash tank
   n) Make-up feed water tank
   o) Steam separator and oil traps
   p) Exhaust head
   q) Feed water heaters
   r) The slip-joint expansion fitting
   s) Double-slip expansion fitting
   t) U-loop
   u) Swing joint
   v) Anchors and guides
   w) Steam and gas
   x) Properties of saturated steam
   y) Temperature of superheated steam
7. Boilers
   a) Types
   b) Boiler foaming
   c) Impurities found in water and results when used in boilers
   d) Boiling points at various pressures
8. Heat valve of fuels
9. Artificial illuminating gas
   a) Combustibility
   b) Properties of gas mixtures .
10. Steam line insulating materials
   a) Loss of heat units by radiation, convection
   b) Properties of asbestos, magnesia, aircell covering

B. Trade mathematics
1. Problems in figuring radiation requirements
2. Use of tables of pipe sizes required for given radiator size
3. Pipe layouts — equal and unequal use of the 45-deg. and 90-deg. fittings
4. Pressure on pipe per square inch over given sections or area
5. How to read:
   a) Flow meter
   b) Gas meter
6. Problems in installing high-pressure steam mains
   a) Use of tables of constants for offset measurements
   b) Allowances for fittings in cutting pipe
   c) Use of tables of constants for expansion of pipe lines
   d) Loss in head over length of main
7. Use of tables of pump discharges and pipe capacities
8. Trade method of figuring amount of materials and labor required for steam and hot water heating systems installations

C. Special tools, equipment, and materials
1. Various types of radiator valves
2. Steam pressure gauges
3. Flow meters
4. Flow meter funnel
5. Vertical checks; horizontal checks; globe check valve
6. Check valves
7. Various types and designs of pumps

D. Trade processes
1. Methods of connecting a steam radiator on either high or low-pressure or a vacuum system
2. Method of installing a steam trap
3. How to place and install safety and relief valves
4. How to properly locate and install blow-off valves
5. How to install a water gauge
6. Method of installing a flow meter
7. How to locate and install various types of check valves
8. How to install high-pressure steam mains
9. Methods of installing and connecting a pump
10. Method of installing gas burning equipment
11. Method of installing oil burning units
12. Method of installing stokers
13. Methods of installing and connecting oil and gas tanks

E. Trade information
1. Codes
   a) Municipal
   b) Gas company

F. Blueprint reading and shop sketching
1. Essentials
   a) Mechanical (machine) drawings
   b) Building construction (architectural) drawings
   c) Pipe symbols
2. Problems in reading prints of steam and hot water heating system installations
   a) Determining type of installation
   b) Taking off dimensions and materials
3. Essentials of shop sketching
4. Making sketches of steam and hot water heating system installations

G. Safety and accident prevention
1. Care in handling radiators and valves to avoid injury to worker or materials
2. Cautions to be used when setting traps
3. Always draw fire and allow boiler to cool before attempting any work
4. Dangers from escaping steam or water
5. First aid treatment for burns
6. Safety in the use of hand tools
7. Safety in the use of ladders and scaffolding
8. Dangers in working around gas lines

Course: Plumbing Maintenance and Repairs

Plumbing maintenance and repairs

A. Trade science
1. Principle and operation of force pump
2. Principle and operation of air compressor
3. Chemical solvents — characteristics, uses, and action
4. Action of litharge, glycerine, and porcelain cements
5. Hardness of metals and its relation to grinding valve seats
6. Faucet packing — materials, specifications, and characteristics
7. Action of pressure on loop in Bourden type of gauge
8. Principle of expansion and construction of metals
9. Principle of compensated balances
10. Effects of tree roots on underground

sewers and methods of preventing damages

B. Trade mathematics
   1. Trade method of figuring amount of materials and labor required for specific repair jobs

C. Special tools, equipment, and materials
   1. Valve grinding machine
   2. Bib reseaters
   3. Valve reseaters
   4. Tube expanding tool
   5. Master gauge
   6. Replacement parts

D. Trade processes
   1. Stoppage removal
      a) Locating stoppage
      b) Determining nature of stoppage
      c) Methods of removing stoppages
         1) Use of proper tools that apply to each job
   2. Bibb repairs — repairing leaking faucets or valves
   3. Simple fixture repairs
   4. Replacement of leaking pipes or fittings
   5. Method of repairing and calibrating
      a) Mechanical meter
   6. Methods of replacing gaskets
   7. How to remove worn valve disks and replace same
   8. How to regrind a valve seat
   9. Removal and replacement of floor or other removal to get at stoppage
   10. Thawing out frozen water pipes
   11. Removing rust from hot water piping system

E. Trade information
   1. Plumbing laws and regulations

F. Blueprint reading and shop sketching
   1. Essentials of building construction (architectural) drawings
   2. Problems in reading prints of installation and fixtures

G. Safety and accident prevention
   1. Dangers in using chemical solvents
   2. Dangers in dropping tools on breakable fixtures
   3. Cautions involving shutting off of hot water supply valves and opening faucets with pressure on line
   4. In renewing valve disks be sure pressure has been released from line before starting work
   5. Need for properly tagging main control valve
   6. In renewing valve disks always use graphite and not pipe cement
   7. Safety in the use of hand tools

Course: Sprinkler System Installation

Sprinkler system installation

A. Trade science
   1. Sprinkler head construction and operation
   2. Meeting points of sprinkler head alloys
   3. Sprinkler systems — characteristics, advantages, and disadvantages
      a) Closed dry pipe system
      b) Open dry pipe system
      c) Wet pipe systems
   4. Uses and characteristics of various types of pipe hangers

B. Trade mathematics
   1. Problems in figuring pipe capacity and liquid flow with a given head
   2. Trade method of figuring the amount of materials and labor for sprinkler system installations

C. Special tools, equipment, and materials
   1. Materials
      a) Wet pipe system
         1) Sprinkler heads
         2) Gauges, check valves
         3) Gate valves
         4) Bleeder valves
         5) Long turn bends
         6) Twin fittings
         7) Flange fittings
         8) Special fittings
         9) Gaskets
      b) Dry pipe system
         1) Twin hose nipples
         2) Fire department connections
      c) Hangers of various types
      d) Expansion shields
   2. Tools
      a) Air hammer
      b) Diamond-point drill
      c) Sprinkler head wrench

D. Trade processes
   1. Methods of putting up hangers
      a) Concrete, I beams, wood timbers
      b) Lining up hangers
   2. Methods of installing
      a) Sprinkler mains
      b) Branches
      c) Sprinkler heads
      d) Control valves
      e) Bleeder valves
      f) Gauges
      g) Drain valves
   3. Methods of installing air-pressure chamber and pump

E. Trade information
   1. Underwriters code governing sprinkler systems
   2. Building codes

F. Blueprint reading and shop sketching
   1. Essentials of building construction (architectural) drawings
   2. Piping symbols
   3. Problems in reading prints of sprinkler system installations
      a) Determining type of installation
      b) Taking off dimensions and materials
   4. Essentials of shop sketching
   5. Making sketches of sprinkler system installations

G. Safety and accident prevention
   1. Safety in the erection and use of ladders and scaffolds
   2. The need for properly installing hangers
   3. Methods of tagging control valves
   4. Safeguards against freezing of sprinkler system

Course: Ventilation, Air Conditioning, and Refrigeration

Ventilation, air conditioning, and refrigeration

A. Trade science
   1. Principles of ventilation
      a) What is meant by ventilation
      b) Reasons for installing ventilating systems
      c) Types of systems
      d) Definition of terms
         1) Aeration
         2) Vitiated air
         3) Carbon dioxide
         4) B.T.U.
         5) Convection
         6) Humidity
         7) Saturation
         8) Dew point
   2. The Fahrenheit and Centigrade scales
   3. The nature and characteristics of air
   4. Principles of air conditioning
      a) Definition and purpose
      b) Types of systems
      c) Definition of terms
         1) Refrigerant
         2) Absolute zero
         3) Aquastat
         4) Humidistat
         5) Thermostat
         6) Latent heat
      d) Operation of devices for cleaning air and controlling moisture content
      e) The functions of mechanisms for refrigeration
      f) The advantages and disadvantages of different refrigerants
         1) Cost
         2) Corrosive effect
         3) Safety

B. Trade mathematics
   1. Trade method of figuring the amount of materials and labor for piping installations for ventilation, air conditioning, and refrigeration

C. Special tools, equipment, and materials
   1. Fans and mounting equipment
   2. Air washers
   3. Filters
   4. Refrigerating coils

D. Trade processes

1. Method of installing fans, air washers, and filters
2. Piping installations for ventilating, air conditioning, and refrigerating systems

E. Trade information
1. Building and plumbing codes
2. Equipment manufacturers specifications

F. Blueprint reading and shop sketching
1. Essentials of building construction (architectural) drawings
2. Piping symbols
3. Problems in reading prints of installations for ventilation, air conditioning, and refrigeration
   a) Determining type of installation
   b) Taking off dimensions and materials
   c) Reading drawings of equipment such as air washers and filters
4. Essentials of shop sketching
5. Making sketches of various installations

G. Safety and accident prevention
1. Safety in the use of tools and equipment
2. Safety in the use of ladders and scaffolding
3. Dangers in the use of different types of refrigerants

Course: Lead Wiping

Lead wiping

A. Trade science
1. Metals, uses, characteristics, and specifications
   a) Lead
   b) Solder
   c) Tin
   d) Brass
   e) Antimony
   f) Zinc
   g) Copper
2. Prepare and maintain proper quality of plumber's solder
3. Preparation of joints for wiping
4. Wiping cloths and their preparation

B. Trade mathematics
1. Trade method of figuring amount of materials and labor

C. Special tools, equipment, and materials
1. Tools
   a) Files
   b) Dividers
   c) Soldering iron
   d) Torch
   e) Shave hook
   f) Plumber's candle
   g) Rasp
   h) Tap borer
   i) Bending pin
   j) Turn pin
   k) Dresser
   l) Furnace
   m) Pot
   n) Ladle
   o) Wiping cloths
   p) Spit stick
2. Materials
   a) Rosin
   b) Soil
   c) Wiping solder

D. Trade processes
1. Preparation and wiping of
   a) Floor flange
   b) Wall flange
   c) Round joints, lead to lead
   d) Round joints, lead to brass
   e) Branch T joints
   f) Branch Y joints
   g) Lead bands and ferrules

E. Trade information
1. Plumbing laws and regulations

F. Blueprint reading and shop sketching
1. Symbols for various pipe and joints
2. Sketching joints

G. Safety and accident prevention
1. Understand and avoid dangers present when working with lead
2. First aid for burns

Course: Pipe Welding

Pipe welding

A. Trade science
1. Essentials of oxyacetylene welding
   a) Principle of oxyacetylene welding
   b) Operation of equipment — torches, regulators, cylinders, etc.
   c) Welding rods and their uses
2. Essentials of arc welding
   a) Principle of arc welding
   b) Operation of welding machine

B. Trade mathematics
1. Trade method of figuring amount of materials and labor

C. Special tools, equipment, and materials
1. Oxyacetylene welding equipment
2. Arc welding machine and equipment
3. Selected pieces of pipe for welding

D. Trade processes
1. Welding steel pipe
   a) Butt weld
      1) Flat
      2) Vertical
      3) Overhead
   b) T's, L's, Y's, etc.
   c) Cutting and beveling steel pipe
2. Bronze welding galvanized pipe
3. Silver soldering and welding brass and copper tubing and pipe
4. Lead welding

E. Trade information
1. Plumbing laws and regulations
2. Use of welding equipment manuals

F. Blueprint reading and shop sketching
1. Pipe and welding symbols
2. Interpreting welding symbols
3. Making sketches of various joints and welds

G. Safety and accident prevention
1. Safety rules for the use of welding equipment
   a) Oxyacetylene
   b) Arc

Course: Piping for High and Low Pressure Boilers

Piping for high and low pressure boilers

A. Trade science
1. Steam, nature and characteristics
   a) Temperature of steam at various pressures
   b) Boiling point of water at various pressures
2. Boilers
   a) Effects of gases and heat on boiler tubes and grates
   b) Properties of compressed air
   c) Soot, nature and characteristics
   d) Results of accumulation of soot
3. Reading prints of boiler installations and high and low pressure steam lines
   a) Determining type of installation
   b) Taking off dimensions and materials
4. Essentials of shop sketching
5. Sketching high and low pressure steam line installations

B. Safety and accident prevention
1. Safety in the use of tools and materials
2. Extreme caution to be used when working on high pressure work
3. The need for rigid inspection in boiler work

Course: Special Installations

I. Hydraulic Power Piping
II. Pneumatic Piping
III. Industrial Process Piping

Special installations

A. Trade science
1. Properties of liquids under pressure
2. Bursting pressure of piping
3. Tensile strength of piping
4. Effect of acids on metals and alloys
5. Friction in flow
6. Friction in bends
7. Composition of compressed air
8. Compressibility of air
9. Industrial processes requiring piping

B. Trade mathematics
1. Expansion coefficients and their application to hydraulic power piping
2. Problems in pressures per square inch
3. Problems in figuring air pressures
4. Trade method of figuring amount of material and labor for special installations

C. Special tools, equipment, and materials
   1. Special alloys for special purposes
   2. Special tools

D. Trade processes
   1. Methods of installing high pressure piping for pneumatic lines
   2. Methods of installing high pressure piping for hydraulic lines
   3. Methods of installing industrial process piping
   4. Methods of installing and repairing apparatus for compressed air

E. Trade information
   1. Building codes
   2. Trade handbooks

F. Blueprint reading and shop sketching
   1. Essentials of building construction (architectural) drawings
   2. Piping symbols
   3. Reading prints of special piping installations
      a) Determining type of installation
      b) Taking off dimensions and materials
   4. Essentials of shop sketching
   5. Sketching special piping installations

G. Safety and accident prevention
   1. Safety in the use of tools and materials
   2. Extreme caution to be used when working on high pressure work
   3. Safety rules for installing high pressure hydraulic lines — XH pipe and fittings, rigging and supports
   4. Caution when operating and testing tanks and piping

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Syllabus in Aircraft Drafting

WILLIAM H. BOWERS
High School
Tuckahoe, N. Y.

This syllabus on aircraft drafting is intended to fill a spot that up to now has been almost entirely neglected by our senior high schools.

Aircraft building, in the past few years, has become one of the largest industries in the United States. Almost every high school student is fascinated and interested by this phase of industry. Voluntary enlistments in the U. S. Air Corps is proof of this. It will continue to be a big field of employment to hundreds of thousands of our boys and girls.

Orthographic projection is used and the same fundamental principles apply as have been taught in Mechanical Drawing I and II. Aircraft drafting differs from other types of drafting in the use of special materials, shop processes, and procedures. The ratio of strength to weight must always be considered; all requirements of the military and civilian authorities must be met, in order to achieve safety and serviceability of each part of the plane.

It is suggested that *Engineering Drawing* by French, 1941 edition, be referred to constantly for general information on aircraft drafting. Chapters three and four refer to lines and lettering.

The textbook, *Fundamentals of Aircraft Drafting* by Brydon is being used here in Tuckahoe High School, Tuckahoe, N. Y. This text contains thirty problems suitable for classroom drafting.

It is suggested that the book *Aircraft Drafting Details* by Meadowcraft be used for homework notebook and sketches. The notes in this syllabus are taken from the book. The final test in aircraft drafting is based upon the subject matter contained in this notebook. This test is in the February issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine, 1945.

Aircraft drafting may be substituted for cams and gears, Mechanical Drawing 3, if the student requests same. Aircraft drafting was inaugurated in this school because of the intense interest of the drafting students in aircraft.

Another excellent book *The Aviation Mechanic*, by Norcross and Quinn, contains a fine picture of the actual building of a Luscombe, a small plane, Chapter five, pages 149 to 212 inclusive. Chapter six, Building a Light Plane, contains invaluable information to a drafting student.

Objectives:

1. To teach the student primary layouts of aircraft structures and also to point out some of the characteristic details.
2. To create an understanding of the fundamental construction of airplanes.
3. To develop greater accuracy and better drafting techniques.

Prerequisite:

1. Mechanical Drawing I
2. Mechanical Drawing II
3. Advanced Mathematics

Time: Five periods per week, classwork for one semester.

Homework: Notebook and aircraft sketching

Methods of Study:

1. Class recitations
2. Homework (notebook and sketches)
3. Daily drafting practice
4. Individual instruction and criticisms

Number of Plates Required:

1. Eight to ten; every third plate either inked or traced.
2. Size drafting paper 12 by 18 in., suitable key placed in lower right corner of border line.

Examinations: One at end of first ten weeks' period. Final examination at end of the term.

Rating: Based upon finished plates, techniques, notebook, citizenship in drafting room.

Credits: One half unit.

Suggested Plates

Textbook: *Fundamentals of Aircraft Drafting*, Brydon

1. Airfoil profiles
2. Wing construction
3. Laminated spars
4. Elevator and stabilizer
5. Elevator and stabilizer details
6. Rudder and fin
7. Fuselage
8. Detail of rudder and elevator control
9. Landing gear
10. Three view outline

Extra Plates

1. Metal tubular construction
2. Radial motor mount

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Meadowcraft, *Aircraft Detail Drafting* (New York: McGraw-Hill Book Co.).

Brydon, *Fundamentals of Aircraft Drafting* (New Orleans, La.: R. Brydon, 615 City Park Ave.).

Thompson, James Edward, *Aircraft Drafting Room Manual* (Toronto, Can.: Associated Publishers).

Colvin and Colvin, *The Aircraft Handbook* (New York: McGraw-Hill Book Co.).

Norcross, *Aircraft Blue Prints and How to Read Them* (New York: McGraw-Hill Book Co.).

Anderson, *Aircraft Layout and Detail Design* (New York: McGraw-Hill Book Co.).

French, *Engineering Drafting 1941* (New York: McGraw-Hill Book Co.).

Younger, J. E., *Airplane Construction and Repair*.

Warner and Johnston, *Aviation Handbook*.

N.A.C.A. (reports, etc.) Washington, D. C.

Norcross and Quinn, *The Aviation Mechanic* (New York: McGraw-Hill Book Co.).

A Course in Art Metalcraft

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This course in art metalcraft is intended for senior high school classes or for work on a college level. Previous experience in bench metalwork is a desirable requisite for students enrolling in the subject. The projects are suggested, using such metals as aluminum, copper, brass, pewter, nickel silver, and sterling silver.

To insure flexibility, this course is outlined on a threefold basis: (1) an outline of the course sequence; (2) a reference index of projects in art metalwork; and (3) a reference index of operations in art metalwork. A teacher can adapt these outlines to meet local needs and problems.

THE REFERENCE BIBLIOGRAPHY

Baxter, W. T., *Jewelry, Gem Cutting, and Metalcraft* (New York: McGraw-Hill Book Co., 1938).

Bick, A. F., *Artistic Metalwork* (Milwaukee, Wis.: The Bruce Publishing Co., 1940).

Kronquist, E. F., *Metalcraft and Jewelry* (Peoria, Ill.: The Manual Arts Press, 1926).

Osburn, B. N., and Wilber, G. O., *Pewter — Spun, Wrought, and Cast* (Scranton, Pa.: International Book Co., 1938).

Payne, A. F., *Art Metalwork with Inexpensive Equipment* (Peoria, Ill.: The Manual Arts Press, 1914).

Rose, A. F., *Copper Work* (New York: Atkinson, Mentzer and Co., 1908).

Smith, R. E., *Units in Etching, Spinning, Raising, and Tooling Metal* (Wichita, Kans.: The McCormick-Mathers Publishing Co., 1939).

Varnum, W. H., *Pewter Design and Construction* (Milwaukee, Wis.: The Bruce Publishing Co., 1926).

The Course Sequence

The basic skills should be experienced in an ascending order of difficulty. Much of the procedure in art metalcraft depends upon the operations learned in an earlier assignment. Painstaking care in the fundamentals will tend to insure the professional appearance desired in an art metal project. To analyze the following assignments, see the "Reference Index of Projects," and the "Reference Index of Operations." These indexes are prepared to aid in lesson planning. Lectures and demonstrations may be scheduled to fit the given program.

Outline of Suggested Assignments

Assignment I. To make a letter opener

(Optional projects: book mark or identification wrist tag)

This project can be made of any of the common sheet metals. It will give the student experience in transfering designs, trimming, filing, polishing, and etching.

Assignment II. To make a chased wall plaque

(Optional projects: chased overlay for handkerchief box or coffee table)

This project introduces chasing technique, i.e., raising a design in relief against a tooled background. Sheet brass, copper, or aluminum in a very thin gauge is desirable. The plaque is mounted on a suitable plywood base after polishing and lacquering.

Assignment III. To make a card tray

(Optional projects: ash tray, pin tray, salver, bowl, or porringer)

A tray is raised over a stake, or over a concave form, or by "beating down." A variety of surface decoration can be produced by blind tooling, etching, or by piercing. A tray must be annealed and pickled during the raising process.

Assignment IV. To make a pair of book ends

(Optional projects: pierced teapot stand, house numerals and name plate, letter caddy, or mail box)

In addition to previous operations, soldering technique may be introduced.

Assignment V. To make a bracelet

(Optional projects: napkin ring, belt-buckle set, watch fob, or class key)

Assignment VI. To make a jewel box

(Optional projects: match box, cigarette box, hinge-and-hasp set, drawer pulls, or incense burner)

The operation of braking, folding, and soldering art metal into a box shape is introduced.

Assignment VII. To make a ring

(Optional projects: dress clip, brooch, or belt buckle)

Using coin silver, nickel silver, or genuine sterling silver, this project introduces hard-soldering technique. It may represent a continuation of soft-soldering.

Assignment VIII. To make a desk lamp

(Optional projects: porch lantern, night lamp, or wall sconce)

Electric wiring is combined with an art-metal subject.

Assignment IX. To cast a paper weight

(Optional projects: trophy, statuette, or spoon)

Patternmaking and the construction of plaster molds is required. A variety of unique subjects may be cast in pewter, or even in an alloy of bar solder. Surface polishing can be experimented with further.

Assignment X. To make a pewter creamer

(Optional projects: sugar bowl, humidor, or incense burner)

If the soft-soldering technique for pewter has not been practiced earlier, this project is too difficult. Simple pewter articles should be attempted, first.

Reference Index of Projects

The eight references listed in the foregoing bibliography are selected textbooks which provide a rich fund of information on the subject of art metalcraft. The industrial-arts teacher may refer to the following index, when searching for suitable projects:

The Index

Ash Trays
Baxter, W. T., pp. 31–35.
Smith, R. E., pp. 50, 55.

Book Ends
Baxter, W. T., p. 41.
Bick, A. F., pp. 152–154.
Kronquist, E. F., p. 125.
Payne, A. F., pp. 71, 72.

Bracelets
Baxter, W. T., pp. 86–93.
Brooches and Pins
Kronquist, E. F., pp. 33–60.
Bowls
Baxter, W. T., pp. 35–37.
Kronquist, E. F., pp. 151–153.
Payne, A. F., pp. 120–128.
Smith, R. E., pp. 19–24, 52.
Creamers and Sugar Bowls
Varnum, W. H., pp. 50, 51, 53–55, 90.
Desk Calenders
Baxter, W. T., pp. 27–29.
Writing Desk Set
Kronquist, E. F., pp. 146–150.
Payne, A. F., pp. 66–69.
Rose, A. F., pp. 52, 53.
Drawer Pulls
Kronquist, E. F., pp. 131–134.
Payne, A. F., pp. 81–84.
Rose, A. F., pp. 34–42.
Hinges
Payne, A. F., pp. 76–81.
Rose, A. F., pp. 31–33, 42–48.
Lanterns
Kronquist, E. F., pp. 138–143.
Payne, A. F., pp. 95–106.
Letter Holders
Baxter, W. T., pp. 27, 28.
Smith, R. E., p. 7.
Letter Openers
Baxter, W. T., pp. 20, 21.
Kronquist, E. F., p. 129.
Osburn, B. N., and Wilber, G. O., p. 52.
Payne, A. F., pp. 60, 61.
Smith, R. E., p. 52.
Match Boxes, Cigarette Boxes, or Jewel Boxes
Baxter, W. T., pp. 22–24.
Bick, A .F., pp. 148–150.
Kronquist, E. F., pp. 90, 91.
Payne, A. F., pp. 86, 88, 107.
Rose, A. F., pp., 54–66.
Picture Frames
Baxter, W. T., pp. 29–30.
Rose, A. F., pp. 73–75.
Porringers
Osburn, B. N., and Wilber, G. O., pp. 72–74.
Rose, A. F., pp. 93–97.
Varnum, W. H., pp. 63–72.
Rings
Baxter, W. T., pp. 65–86.
Kronquist, E. F., pp. 61–67.
Salvers or Trays
Bick, A. F., pp. 125–128.
Kronquist, E. F., pp. 165, 166.
Osburn, B. N., and Wilber, G. O., pp. 57–62.
Payne, A. F., pp. 109–114.
Smith, R. E., pp. 14–18, 50, 51.
Varnum, W. H., pp. 42, 48.
Spoons
Bick, A. F., pp. 227, 228.
Osburn, B. N., and Wilber, G. O., p. 102.
Payne, A. F., pp. 178–186.
Syrup Pitchers
Osburn, B. N., and Wilber, G. O., pp. 32–43.
Wall Plaques
Payne, A. F., pp. 116–118.

Reference Index of Operations

In organizing a new course, some teachers prefer to base the subject on a job analysis of the typical operations and processes involved. Job analysis affords an objective viewpoint on which to plan the order and sequence of laboratory assignments. One may easily refer to the following index of operations:

The Index

Marking and Laying Out
Bick, A. F., pp. 13, 14.
Kronquist, E. F., pp. 11, 12.
Osburn, B. N., and Wilber, G. O., pp. 29–37.
Casting
Baxter, W. T., pp. 112–120.
Filing
Bick, A. F., pp. 23–26.
Kronquist, E. F., pp. 23–26.
Osburn, B. N., and Wilber, G. O., p. 35.
Smith, R. E., p. 5.
Drilling
Bick, A. F., pp. 69–71.
Kronquist, E. F., pp. 11, 12, 20, 23.
Piercing With Jeweler's Saw
Baxter, W. T., pp. 18–20.
Bick, A. F., p. 18.
Osburn, B. N., and Wilber, G. O., p. 83.
Kronquist, E. F., pp. 20, 22–24.
Payne, A. F., pp. 73–84.
Smith, R. E., p. 6.
Riveting
Baxter, W. T., p. 27.
Bick, A. F., pp. 70, 71.
Kronquist, E. F., pp. 126, 127.
Payne, A. F., pp. 88, 91.
Rose, A. F., pp. 113, 114.
Soft-Soldering
Baxter, W. T., pp. 6–11.
Bick, A. F., pp. 71–85.
Kronquist, E. F., pp. 117–123.
Osburn, B. N., and Wilber, G. O., pp. 38–43.
Varnum, W. H., pp. 49–55.
Hard-Soldering
Baxter, W. T., pp. 50–64.
Kronquist, E. F., pp. 28–32.
Payne, A. F., pp. 138–140.
Rose, A. F., pp. 77, 78.
Raising
Baxter, W. T., pp. 31–41.
Bick, A. F., pp. 38–47.
Kronquist, E. F., pp. 151–172.
Payne, A. F., pp. 98–100, 120, 132–138.
Osburn, B. N., and Wilber, G. O., pp. 63–76.
Rose, A. F., pp. 81–91.
Smith, R. E., pp. 10, 11, 16–23.
Varnum, W. H., pp. 40–48.
Planishing
Bick, A. F., pp. 63–68.
Kronquist, E. F., pp. 79, 124, 154.
Osburn, B. N., and Wilber, G. O., pp. 57, 60, 67.
Payne, A. F., pp. 101, 102.
Smith, R. E., p. 23.
Fluting
Baxter, W. T., pp. 35–38.
Bick, A. F., pp. 33, 34.
Osburn, B. N., and Wilber, G. O., p. 79.
Payne, A. F., pp. 125–131.
Smith, R. E., p. 24.
Annealing and Pickling
Baxter, W. T., pp. 14, 62, 63.
Bick, A. F., pp. 19, 20, 94, 95.
Kronquist, E. F., pp. 12–15.
Payne, A. F., pp. 86–88.
Rose, A. F., pp. 25, 26.
Smith, R. E., pp. 41, 42.
Chasing and Repousse
Bick, A. F., pp. 57–61.
Kronquist, E. F., pp. 52, 53, 69–96.
Payne, A. F., pp. 115–120, 160–168.
Osburn, B. N., and Wilber, G. O., pp. 81–83.
Rose, A. F., pp. 78, 79.
Smith, R. E., pp. 7–13.
Varnum, W. H., pp. 109–117.
Engraving
Bick, A. F., pp. 61, 62.
Kronquist, E. G., pp. 50–52.
Osburn, B. N., and Wilber, G. O., p. 85.
Smith, R. E., pp. 9, 10, 13, 14.
Varnum, W. H., pp. 117, 118.
Etching
Baxter, W. T., pp. 11–14.
Bick, A. F., pp. 62, 63.
Osburn, B. N., and Wilber, G. O., pp. 83–85.
Payne, A. G., pp. 53–58.
Smith, R. E., pp. 40, 41.
Polishing
Baxter, W. T., pp. 14–16, 65, 76, 77.
Bick, A. F., pp. 90–94.
Osburn, B. N., and Wilber, G. O., pp. 76, 94, 119.
Smith, R. E., pp. 47–49.
Varnum, W. H., pp. 55, 93, 94.
Coloring and Oxidizing
Baxter, W. T., pp. 16–18, 77.
Bick, A. F., pp. 95, 96.
Kronquist, E. F., pp. 173–179.
Payne, A. F., pp. 39–48.
Rose, A. F., p. 118.
Smith, R. E., pp. 38–42.

Bench Metal Outline

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I. Selection material
A. How steel is manufactured
1. Railroad rail and car wheels
2. Making of pipe, wire, and nails
B. Bill of material
1. Sizes of mild steel
a) Thickness, width, and length are given
2. Units in which items are sold
a) By linear foot or pound
II. Layout of the metal
A. Tools
1. Rule
2. Prick punch

3. Center punch
4. Scriber
5. Combination square
6. Calipers
7. Dividers
8. Surface gauge

III. Cutting metal
A. Shears
1. Slitting
a) Lever
1) How and when used
2) Capacity
b) Beverly
3) Description

B. Hack saw
1. How to use
a) Stance
b) Speed
c) How held in the hands
2. Selection of a blade
3. Kinds of hack saws
4. Direction of teeth in the frame

C. Cold chisel
1. In the vise
2. On a lead plate
3. Sharpening the chisel
4. Kinds of cold chisels
a) Where each kind is used

IV. Making a hole
A. Center punching
B. Safety items for power drill press
1. Only one person at the drill press at one time. That person will operate it. No one should be asked to turn the power on or off.
2. Clamp work in the drill press vise.
C. Enough pressure on the spindle to make the drill cut. Not so much that the drill breaks or burns.
D. Speed of drill
1. Larger drill requires slower speed
E. Sharpening the drill bit
1. Names of the parts of the bit
2. Sizes of drills
3. Lip clearance in grinding

V. Grinding metal
A. How a grinder wheel is manufactured
1. Grade of abrasive used
2. Selection of the proper wheel
B. Safety
1. Use correctly adjusted tool rest
2. Protect eyes with a shield
C. Do not grind soft metal
1. Aluminum, copper, or lead
D. Dressing the wheel

VI. Filing
A. Classification of files
1. Shapes
a) Half-round, square, pillar, flat, hand, rattail, mill, knife
2. Measurement of length
a) Tang not included in the length
3. Degree of coarseness
a) Rough, bastard, 2nd cut, smooth, and dead smooth
4. Kinds of cut
a) Single, double, rasp, vixen

B. Kinds of filing
1. Straight filing
2. Drawfiling
3. Lathe filing

C. Using a file
1. Rate of speed
2. Stance
3. How the file is held in the hands
a) To take a heavy cut
b) To take a light cut
4. Choosing the correct file to use
a) Double cut file to remove material fast
b) Single cut file or smooth degree of coarseness for finishing
5. Safety
a) Always have a handle on the file
6. Care of files
a) Not thrown together
b) Use on soft material first
c) Keep file clean
1) Use file card

VII. Decorating metal
A. Ends
1. Flattening and cutting to different shapes

B. Surface
1. On the metal
a) Natural finish
b) Peen with ball-peen hammer
c) Peen with cross-peen hammer
d) Heating with a torch
e) Smoke finish
f) Spot finish
g) Satin finish
2. Use of an applied finish
a) Flat black paint
b) Blowing on bronze powder before the paint is dry
c) Crackle enamel
d) Several paints in water
e) Clear lacquer
3. Combination of 1 and 2
a) Antique finish
b) Many other combinations can be made

VIII. Bending and twisting
A. Angular bends
1. Allowance for bending
B. Circular bends
1. Making an eye
C. Bending scrolls
1. Making a plan of the scroll
a) Use squared paper
b) Use this pattern to find length of metal and to bend scroll correctly
c) Good scroll design
2. Using the bending jig
a) Different kinds of jigs
D. Twisting metal

IX. Casehardening
A. Purpose
B. What actually happens during casehardening
1. More carbon is added to the metal

X. Polishing
A. Wooden wheel with strip of emery cloth around it
B. Felt or canvas wheel
1. Fasten emery on with glue or water glass
C. Emery cloth or aluminum oxide
1. Grade of abrasive
2. Roll or sheet
a) Size
D. Crocus cloth
E. Soft muslin wheels
1. Used in the final process of buffing
2. Polishing compound put on wheel
a) Tripoli
b) Nu-White
c) Jewelers' rouge

XI. Joining metal together
A. Riveting
1. Tools needed
a) Ball-peen hammer and riveting block
2. Knowledge about rivets
a) Information needed to order rivets
1) Shape of head, diameter and length of shank
b) Amount of shank needed to form *shop head*
c) General specifications of *shop-head*

B. Taps and dies
1. How to use
2. Where to find information on size of hole drilled before tapping
C. Bolts, nuts, screws, wrenches
1. Types of each

XII. Pipe work
A. Measurement of pipe
B. Cutting pipe
C. Threading pipe
D. Fittings
1. Elbows, nipples, couplings, unions, caps, plugs, tees

Operations in Bench Metal

1. Read a working drawing.
2. Plan a procedure of operations.
3. Check material as received.
4. Make out a bill of material.
5. Measure metal for cutting.
6. Layout work.
7. Cut metal with a slitting shear.
8. Cut metal with a Beverly shear.
9. Cut metal with a hack saw.
10. Cut metal with a cold chisel.
11. Drill a hole with a power drill press.
12. Grind metal.
13. Filing metal.

14. Decorate metal.
15. Making angular bends.
16. Bending an eye.
17. Making a scroll.
18. Twisting metal.
19. Casehardening.
20. Use the power buffer.
21. Rivet with soft iron rivets.
22. Use taps and dies.
23. Cutting pipe.
24. Threading pipe.
25. Joining pipe.

Information Topics in Bench Metal

1. Hacksaws
2. Files
3. S.A.E. numbering system for steels
4. How steel is made and shaped into railroad rail, pipe, wire, nails
5. Rivets, bolts, nuts, screws, washers, wrenches — names, sizes, uses of each type
6. Training for trades of machinist, car mechanic, welder
7. Principles of drop forging
8. Metal finishing and electroplating
9. Pipe measurement

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Aviation Training in the Small High School

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(Continued from page 276 of the September, 1948, issue)

Part II. Evaluation of the Offerings of Aviation

In the first part of this article an attempt was made to determine the function of aviation in modern life, the aims of secondary and industrial-arts education to which any aviation program would have to contribute, and the limiting factors to which an aviation program would be subjected. These factors were discussed in order to establish criteria for determining what aviation has to offer the industrial-arts program.

To determine the offerings of aviation, the entire field of the aviation industry was surveyed and divided into two major divisions, namely, (*a*) air transportation and (*b*) aircraft production and manufacture. The major division of air transportation was broken down into seven distinct areas, as follows: (1) Flight operations; (2) Passenger and freight service; (3) Meteorology; (4) Aircraft radio operation and maintenance; (5) Airplane powerplant maintenance; (6) Airplane structural maintenance; (7) Airplane maintenance.

The major division of aircraft production and manufacture did not seem to require a further breakdown. The seven areas of air transportation just listed, and the major division of aircraft production and manufacture were closely examined to determine the more important phases of activity in each division. The survey of these major areas of aviation industries resulted in the following groupings:

Air Transportation

Flight Operation—(1) Piloting, (2) Radio operation, (3) Navigation, (4) Flight engineering (engine operation), (5) Stewardship.

Passenger and Freight Service—(1) Passenger trafficking, (2) Freight trafficking, (3) Airplane handling and servicing, (4) Airport management.

Meteorology—(1) Weather observation, (2) Weather forecasting, (3) Rawinsonde operation.

Aircraft Radio—(1) Radio maintenance, (2) Radio operation, (3) Radar operation and interpretation.

Aircraft Powerplant Maintenance—(1) Engine maintenance, (2) Electrical system maintenance, (3) Fuel and oil system maintenance, (4) Engine instrument maintenance, (5) Propeller maintenance, (6) Turbosupercharger maintenance.

Aircraft Structural Maintenance—(1) Sheet metal repair, (2) Woodwork repair, (3) Welding, (4) Fabric repair, (5) Machine work.

Airplane Maintenance—(1) Hydraulic system maintenance, (2) Wheel and brake maintenance, (3) Flight control surface and mechanism maintenance, (4) Flight instrument maintenance, (5) Miscellaneous equipment maintenance (deicing, oxygen, fire extinguishing equipment, etc.).

Aircraft Production and Manufacture

Factory Occupations—(1) Electroplaters, (2) Assemblers and installers, (3) Machine operators, (4) Inspectors, (5) Mechanics, (6) Woodworkers, (7) Machinists, (8) Sheet-metal workers, (9) Welders, (10) Miscellaneous.

These areas or phases of aviation were evaluated against the criteria which were previously discussed and listed. It was found that some areas possessed little or no value for the industrial-arts program and consequently could be eliminated from the discussion without further consideration. For example, in the area of flight operations it was found that piloting and navigation of aircraft were inappropriate as shop subjects and, it is also believed, too

advanced for the age of the average pupil. Therefore, to include any pilot training or aircraft navigation in the industrial-arts program would not be worth while. Stewardship was not considered appropriate as an industrial-arts subject either.

In the evaluation of the area of passenger and freight service, passenger trafficking, freight trafficking, and airport management were not considered for possible inclusion in the industrial-arts program, since they obviously are not at all appropriate as shop subjects. The remaining areas of airplane handling and servicing apparently possess content material of some value for industrial arts.

The area of meteorology possessed little of value as curriculum material for the industrial-arts program. The remaining areas of aircraft radio, aircraft power-plant maintenance, aircraft structural maintenance, airplane maintenance, and aircraft production and manufacture are areas possessing certain features which justify their inclusion in an industrial-arts aviation training program.

The areas mentioned in the foregoing paragraph were closely examined in an effort to determine what shop experiences and knowledge (things to do and things to know) are required in each of the areas. This resulted in a lengthy list from which was selected what should or should not be included in an industrial-arts program and thus was determined the extent to which aviation training should be carried in the industrial-arts program. The listings are of such length that it would be impractical to present them in the space available here. The listings enumerated the basic jobs or operations and knowledges an individual being trained in the category indicated should be able to do and know.

In order to determine what the division of aircraft production and manufacture had to offer to an industrial-arts program, a list (used by a large aircraft manufacturing company) of job descriptions and job evaluations was used. There were approximately 350 factory positions listed in the manual; however, since many positions listed were merely of a higher or lower level of skill, a total of 114 basic positions at the top level of skill were selected for study.

These basic factory positions were grouped under the following major position headings: (1) Electroplaters, (2) Assemblers and installers, (3) Machine operators, (4) Woodworkers, (5) Machinists, (6) Sheet metal workers, (7) Welders, (8) Inspectors, (9) Mechanics, (10) Miscellaneous.

As was the case for the listings of the major division of air transportation, the listings for the division of aircraft production and manufacture were so lengthy that it is not practical to give here a description of the duties performed by personnel in such positions.

In order to obtain a clearer picture of the manner in which the offerings of aviation do meet the criteria of limitations and educational aims, Chart I, *Offerings of Aviation for the Industrial-Arts Program,* (page 273, September, 1948, issue) was developed. The items making up the evaluating criteria are listed on the left-hand side of the chart, and the various phases of aviation experiences are listed at the top.

By numerical count of marks alone, it was found that many of the power-plant phases and the structural repair phases were checked more frequently than the phases of airplane maintenance. The fact that the items under power-plant maintenance seem to be marked rather frequently can be attributed to the thesis that youth is fundamentally interested in creating something or making something operate properly. In the case of power-plant maintenance, this is particularly true. In spite of the fact that in power-plant maintenance the individual may only be removing, installing, and adjusting — it is done with an understanding of the basic principles of engine operation and with the knowledge that the engine must be made to run.

The large number of markings found in the area of aircraft structural maintenance probably can be attributed to the fact that in this area there exists a series of doing operations which are present in and are acceptable to the industrial-arts program. For example, in the area of aircraft welding it was found that 70 to 75 per cent of the operations listed in this study were also listed in the AVA Bulletin, "Improving Instruction in Industrial Arts." In aircraft sheet metal 50 to 60 per cent, in aircraft machine work practically 100 per cent, and in aircraft woodwork 70 per cent of operations listed in the study were found in the lists developed by the AVA. This is also the case with respect to the occupations of woodworker, machinist, sheet-metal worker, and welder listed in the major division of aircraft production and manufacture.

The infrequency of marks to be found in the area of airplane maintenance, such as flight instruments, flight controls and mechanisms, and miscellaneous equipment is predicated upon the fact that once the pupil has done many of the operations listed, there is no immediate result or activity because of his completion of the operation. The result is directly opposite to that found in the area of power-plant maintenance. Instead of making a machine function properly, the student is just removing and replacing a unit which results in no motion as a result of the removal and replacement of the unit. An analogy may be made with the removal and replacement of a door — there is no evident result of any action other than placing a different door in the door frame. In teaching, this would appear to be an important factor, since actual removal and installation, disassembly and assembly of airplane units would be restricted unless the units were defective. If the unit were not defective, there would not be any logical reason for performing such operations.

In the area of aircraft radio, the reason for such a large number of markings is the same as that in the area of power-plant maintenance. There is a tangible and active outcome as the result of accomplishing any of the operations listed. For example, by placing a "tuned-out" condenser in one of the radio circuits and requiring the individual to determine and correct the difficulty, the way has been paved for a series of operations which will result in the satisfactory functioning of the radio. The feeling achieved by the individual in making the radio function properly can be likened to that of his creating something from material, a form or object which did not previously exist in the material.

Conclusions and Recommendations

In a review of the data obtained thus far, there seems to be one factor which stands out with respect to aviation training as part of the industrial-arts program of the small high school. That factor is the lack of evidence which would justify an aviation training program of separate courses within the industrial-arts curriculum of the type of high school considered in this discussion. Based upon the evidence shown, it is hard to conceive of an *aviation course* or *aviation shop* set up in a manner similar to the subjects of mechanical drawing, graphic arts, general shop, general metals, or general woodworking.

To set up a series of courses such as *aircraft engines, aircraft sheet metal, aircraft mechanics,* etc., within the structure of the industrial-arts program of the small high school would make it rather difficult to fulfill the educational aim of *making boys and girls intelligent about their environment in order that they may deal with it effectively.* Being more specific, the following question may be asked, "Does aviation constitute a sufficiently large factor in the environment to justify so great an emphasis on it?" The answer seems clearly to be *no!* This is particularly true in the case of the small high school which already finds it rather difficult to maintain a broad program in industrial activities.

To make certain that the reason for not including separate courses on aviation within the industrial-arts program is understood, we may ask: If it is sufficiently important to include aviation training in the form of separate courses in order that youth may become more "intelligent about the environment in which they live so that they may deal with it effectively," is it not just as important to include other courses on transportation, such as railroads, automobiles and trucks, ships? All play an important part in the life of the individual and can undoubtedly provide content material for the industrial-arts program.

In spite of the fact that many schools and communities have already included aviation courses within the industrial-arts program as separate courses, such programming is not recommended by the writer for the small high school.

This does not mean that anything which is related to or allied to aviation should not be included in the industrial-arts program. A glance at the chart presented, previously, indicates that aviation does have something to offer to the industrial-arts program of the small high school. While there are elements of aviation which do not lend themselves to being developed as a separate course of study at the small high school level, there is a sufficient amount of educative value to such elements that every effort should be made to fit them into the existing course of studies of the present industrial-arts program as units of existing courses.

Consider the area of aircraft power-plant maintenance. It would seem rather difficult, based upon the evaluation made in Chart I, to justify a course of study on aircraft power-plant maintenance for the small high school. The area of power-plant maintenance meets the limiting criteria rather well. The educational aims cannot be fulfilled as well as one might desire. This area, however, will fulfill the educational aim of understanding power and would thus justify its existence as a part of any course of study which deals with the topic of power and its development. Therefore, it is recommended that, if there is any desire or need to include some form of aviation training, the area of aircraft power plants be included with the existing course on engine mechanics, auto mechanics, or power units.

In many instances, such courses as those indicated do not exist in the industrial-arts curriculum. If that be the case, an opportunity for establishing a power units course exists, and included in such a course would be the area of aircraft power-plant maintenance and repair. If a power units course of study were offered, it would be expected that some form of related instruction and shop experience on the following power units would be provided: (1) water wheel; (2) steam engine; (3) steam turbine; (4) internal combustion engines which would include (*a*) automobile engine, (*b*) aircraft engine, and (*c*) diesel engine; and (5) gas-turbine engine. The unit on aircraft power plants would cover principally: (1) engine operation and adjustment, (2) engine change and inspection, (3) engine electrical system, (4) induction (carburetion) system, (5) engine instruments, and (6) fixed pitch or ground adjustable type propeller. No work experience would be provided on turbosupercharger systems, although it would be well to include the relationship of a turbosupercharger to the airplane engine as a related information topic.

In the area of airplane mechanics which is covered in Chart I, it was found that there is little that can be offered to the industrial-arts program. Only the phases of hydraulic system maintenance and flight-control surfaces and mechanisms can provide any worth-while content material for the small high school industrial-arts program, and they do not contain sufficient content material for a course. The phase of flight instruments cannot be included because of the complex nature of the equipment, and the only practical shopwork which can be done is the removal and replacement of instruments and a certain amount of testing. Less justification was found for inclusion of the phase of miscellaneous aircraft equipment in the small high school industrial-arts program. This is largely true because of the lack of any educative values in such content material.

The possibility of including some portion of the content material on airplane mechanics in related industrial-arts courses is present. For example, aircraft brake systems could be covered in an auto-mechanics class which is studying the automobile brake system. The brake systems found on most small aircraft are similar in construction and operation. In addition, they are nearly always maintained and repaired in the same manner. Other cases similar to this may be pointed out.

If one were to make an analysis to determine what new processes have been created and new developments have been initiated by aviation, it will be found that aviation to a great extent is utilizing equipment, processes, and materials which have previously been developed. It will probably also be found that aviation did much to improve such existing equipment, processes, and materials. Such is the case of aircraft radio. Radio in aircraft is based essentially upon the same principles utilized in commercial and home radios. Therefore, it seems rather illogical to attempt to establish a course of study on aircraft radio in the industrial-arts program of the small school. Would it not be better to follow a plan similar in form to that suggested on power units? This course could be called "Communications" and would include the following topics or phases: (1) telephone communication, (2) telegraph communication, and (3) radio communication. In the radio communication phase the pupil would study radio operation and radio maintenance. The greater portion of this phase would be given over to the construction and

This picture, "The Old Oaken Bucket," taken by Gene Coffman, West High School Student, Madison, Wis., was awarded a First Prize of $100 in Class IV — Animals and Pets — in the Third Annual 1948 National High School photographic awards

wiring of various radio hookups. One should be cautioned as to the emphasis to be placed upon such a course. It should not be emphasized as an aviation communication course, and every effort should be made to place accurately the importance of communications in industry as a whole.

One area of aviation seems to need little or no justification for inclusion in our program as is evidenced by the data on Chart I. This area is that of aircraft structural repair which includes: (1) aircraft welding, (2) aircraft machine work, (3) aircraft sheet-metal work, and (4) aircraft fabric repair and woodwork. The basic reason for viewing such materials as clearly suitable material for an industrial-arts program is that they make up a large portion of the present industrial-arts program. It has already been pointed out that in the phases of aircraft welding, aircraft sheet metal, aircraft machine work, and aircraft woodwork, the majority of jobs or operations to be performed are the basic operations required in the general fields represented. For example, in aircraft welding, it was found that 70 to 75 per cent of the required operations are basic welding operations which are now being taught in industrial-arts welding shops. The only area which does not involve very many of the basic operations is aircraft welding repair and manufacture. This could easily be included in a course of study on welding. Since such material would emphasize repair rather than manufacture, it would not be necessary to allot much time to it.

In the aircraft machine-work phase, it was found that practically 100 per cent of the machine operations used in aircraft machine work are taught in an industrial-arts machine-shop course. The only point of emphasis concerning aircraft machine work which should be carried into the high school machine shop should be that of machining materials used in aircraft. The machining of special types of magnesium alloys, aluminum alloys, and the higher grades of nickel steel may present problems which are new in the existing school shops.

Again, in the area of aircraft sheet metal, a situation similar to that found in the areas of aircraft welding and machine work is found. Approximately 50 to 60 per cent of the operations required in aircraft sheet metal are the basic operations which are taught in the industrial-arts sheet-metal shop. However, it is not recommended that all of the remaining operations be included in a course of study on sheet metal. Operations in fuel-cell repair do not possess any important educative value because of the specialization required in such work. Aircraft structural repair cannot be recommended for inclusion largely because of the close safety tolerances to which the pupil would have to work. It requires a knowledge of the stresses and loads to which an airplane in flight is subjected which in many cases is above the ability of the high school boy. The sections of aircraft sheet metal which are recommended for inclusion within the structure of an industrial-arts sheet-metal course are airplane metal work and sheet-metal heat treating.

In the case of the area aircraft woodwork, it is rather difficult to recommend any form of aircraft woodwork even though 70 per cent of the work experiences or operations (basic woodwork and machine woodwork) are practically the same as those taught in our industrial-arts wood shops. The use of wood aircraft is not widespread, and the necessity for working to a safe tolerance in making repairs on wood structural members make it rather undesirable to provide a full program in aircraft woodwork. Many schools have included courses in glider construction, which involves all of the work experience and operations found in the area of aircraft woodwork and fabric repair. In the case of large high schools, this may be desirable, but for a small high school there are disadvantages. For example, the instructor must have a CAA license and the glider being constructed must be inspected and approved by CAA inspectors during various stages of construction. Under such a situation, the instructor will probably be found doing much of the work himself. In addition to this, it is necessary that each pupil have a very good background in basic and machine woodwork, which would mean that the industrial-arts program might have to be unbalanced in order to support such a program. In many cases, a very long time is required to complete the glider, and consequently many of the pupils will not have the opportunity to obtain all the work experiences involved in the construction of the glider. Also, many of the boys will miss the thrill of putting the completed glider through its first test flight because of their graduation from school before its completion. These are some of the more important reasons for not recommending the inclusion of any organized courses on aircraft wood and fabric work.

It is possible, however, to develop a project on model airplanes as a part of the established woodworking course to achieve or satisfy class interest. Such a model could be similar in construction to that of regular gliders or wood aircraft and be of sufficient size to warrant use of many of the woodworking tools. This is not being recommended as aviation content material for the industrial-arts program, but is suggested only with the thought of integrating the aviation industry with the wood industries.

In the discussion thus far, the objective has been to arrive at some conclusion and to make recommendations on some phase of aircraft repair and maintenance. No question relative to the production and manufacture of aircraft has been ventured. From a manufacturing and production point of view, there seems to be little or nothing that can be justified. However, some of the recommendations made concerning the area of aircraft repair and maintenance can also be applied to certain areas of aircraft production and manufacture. For example, the recommendations apply to the aircraft factory occupations of machinists, mechanics, sheet-metal workers, woodworkers, and welders. Of the remaining factory occupations listed, only electroplating can be recommended for inclusion in the industrial-arts program. It is believed that electroplating could be fitted in a course of study on machine work if it is not already included.

It is hoped that this discussion will provide a basis for a more detailed and critical analysis than has been presented. At least, it should raise some questions concerning aviation training in the industrial-arts program.

For those who contemplate starting aviation training as a part of their industrial-arts program, it is hoped that this discussion will be of value. The caution one must exercise in embarking upon such a program cannot be emphasized too greatly. It is not a question of whether one should or should not include some form of aviation work in the industrial-arts program. It is a question of how much and how shall it be included. It is a difficult problem to maintain a balanced industrial-arts program in the small high school. In practically every case it will largely depend upon the industrial-arts teacher.

Disabled veterans are the safest drivers on the road, the Massachusetts motor vehicle registrar reports. In the first two years that driving licenses were issued by the Bay State to paraplegic and amputee veterans "there was not one accident resulting in personal injury in which any of these men were involved," he said.

Safety experts of the National Conservation Bureau point out that these veterans, knowing their limitations, are more alert while at the wheel and drive at safe speeds. Many physically normal drivers who operate under the mistaken illusion that they are "safe drivers" would do well to copy the attitudes of their disabled companions of the road. — *Safety Clips.*

The Present Position of Industrial Arts in Canadian Schools

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There is no federal direction or control of education in Canada, although grants in aid of technical and vocational education have been made to all provinces at certain times under mutually agreed conditions. Each of the nine provinces of the Dominion has its own department of education which functions under acts of its own legislature. The Provincial School Acts and the regulations of the education department govern the kinds of schools, the compulsory and optional subjects of instruction, the qualifications of the teachers, the attendance of pupils, the standards of attainment, and the amount of assistance given by the government of the province.

In all provinces there are elected boards of city, town, and rural trustees which operate the schools in their locality under the Provincial Regulations. These local boards provide the school buildings and equipment, set the tax rate, select and pay the teachers, and make arrangements for the organization of instruction, including provision for special subjects such as industrial-arts shopwork when authorized by departmental regulations.

Handwork as an educational medium for use in the middle and upper grades of public schools was started — unofficially — in all the provinces of Canada in 1900–03 through the agency of a manual training fund provided by the philanthropic tobacco manufacturer Sir William C. Macdonald of Montreal and directed by the progressive educationist Professor (later, Dr.) James W. Robertson of Ottawa, who was then Dominion Commissioner of Agriculture.

Most of the instructors engaged for this undertaking came from England where the work was known officially as manual training and so that name was used in Canada for many years. In Scandinavian countries similar work was called sloyd and it was at that time so called in some elementary schools in England and the United States. In United States secondary schools it was commonly called manual training. In Germany it had been given the literal name of Boys' Handwork (Knabenhandarbeit). In France it was known as Travail Manuel, by which name it is still known in French-speaking areas such as the Province of Quebec.

Since the early days, in English-speaking countries, the work has been given many and varied names in an endeavor to indicate its purpose, content, and age level. The several names used at present in different areas may be misleading — different names are sometimes used for the same type of work and similar names are occasionally used for different types of work. Following the trend in school systems and Literature of the United States, shop instruction in the use of numerous tools on varied materials for educational purposes is now generally known in Canada as industrial arts. The term, however, often includes the handwork done in classrooms by primary and intermediate grades under the instruction of the ordinary teacher. When courses of instruction in the upper grades are directed toward particular industries, the work is usually referred to as vocational shopwork, even when it is not specifically trade training. Some high schools are called vocational schools or technical schools. The meaning of the term "high school" as an indication of the grading of the pupils also varies greatly between one province and another.

Because of the educational autonomy of the provinces and the variations of classification and terminology used in the different provinces, it is necessary to have information on the industrial-arts work being done in each province in order to get a picture of the work in Canada as a whole. As there is no central bureau of information on education, it is only possible to get the picture by traveling from coast to coast for three thousand miles from Prince Edward Island in the Atlantic to Vancouver Island in the Pacific, or by the more laborious and time-consuming method of correspondence with nine departments of education. The facts in the following description have been gathered mostly by correspondence but the interpretation comes from one who helped plant the seeds in several of the provinces.

In this survey, the term industrial arts is meant to designate the work being done in school shops under special teachers by pupils of school age as part of their general education, including preparation for industrial life but not extending to trade training.

The Province of Ontario

This province, which has a land area of 363,280 square miles and an approximate population of 4,297,000, contains one third of the population of Canada. It is highly industrialized and has a large proportion of urban schools.

In the schools of Ontario, shopwork is an authorized subject of instruction in grades 7 to 12 and is a compulsory subject for all boys in grade 9. From the early beginnings in 1900 until quite recently the subject was known officially as manual training but it is now called industrial arts and crafts. (This must not be confused with the subject called art and crafts in the Ontario curriculum, which is an art course taught by the class teachers.)

The public and separate (Roman Catholic) schools of Ontario include the lower 8 grades, and may also include grades 9 and 10. The high schools (which are non-denominational) provide for grades 9 to 13.

Elementary industrial-arts and crafts work is taught in grades 7 and 8 — and sometimes in grade 6. It consists mainly of woodwork, sheet-metal work, and drafting. For any grades above 8 in public and separate schools and up to grade 12 in high schools and collegiate institutes, there are graded courses in industrial arts and crafts under the name of general shop. General-shop courses for urban centers are offered in drafting, woodworking, machine-shop practice, applied electricity, motor mechanics, forge and vise work, sheet-metal work and ornamental metalwork. For rural areas and small urban communities, a farm mechanics course is suggested consisting of woodwork, metalwork, electricity, mechanics, and machinery maintenance, all closely connected with the farm and home. In either case, three kinds of work must be taken in addition to drafting, which is compulsory in all grades for those taking shopwork.

The time allotment for the elementary industrial arts and crafts is one and one-half hours per week, with one half day per week suggested for grade 8. The time allotment for general shop is 10 per cent of the class time in grade 9 and 15 per cent of the class time in each of the higher grades. In all grades, all phases of the work

are usually taught in one shop by one teacher. Accommodation is arranged for 20 pupils to be taught at one time by a rotation in the use of the equipment. There are about 160 men teaching the elementary industrial arts and crafts and about 105 men teaching the general-shop work.

For vocational and technical schools, and for composite schools — where a vocational school is combined with a collegiate institute — there are shop courses planned to provide preparatory training for pupils who expect to enter trades and industries. These schools have specially equipped unit-trade shops with a trade-trained instructor for each shop. The courses have a more distinctly industrial content and the jobs have a specific relation to trade practice. Much more class time is given to shopwork in these schools — in grade 9 this amounts to 25 per cent, in grade 10, 35 per cent, and in grades 11 and 12 it may amount to 45 to 55 per cent of the school time. Grade 9 work is used as a tryout or exploratory general course requiring time to be spent in about five unit shops. In grade 10 the pupil may select a particular shop for his major effort — this is usually left until grade 11, when he must do so. There are 8 different courses in grade 9, 12 courses in grade 10, and 15 major courses in grades 11 and 12. The number of men teaching vocational shopwork is about 400.

A shopwork teacher in a vocational school must hold at least an interim ordinary vocational certificate for his particular trade. To obtain this he must take an eight-month special training course at the College of Education in Toronto, where a special school has been established for training industrial-arts teachers. Before entering on the course he must: (1) prove graduation from a secondary school; (2) prove apprenticeship or other training giving journeyman's qualifications in his trade; (3) show several years' wage-earning experience with approved firms; (4) pass written and practical trade tests. The interim certificate is made permanent after two years' successful teaching, certified by an inspector.

The qualifications for teachers of industrial arts and crafts in various types of schools are as follows:

1. To teach in rural schools — elementary, type B, certificate. This demands a second class professional certificate and attendance at two summer school sessions of 125 clock hours each.

2. To teach part time in grades 9 and 10 — elementary, type A. This demands a first class professional certificate, or a high school assistant's certificate, and three summer sessions of 150 clock hours each.

3. To teach full time in public, separate, continuation, and high schools — intermediate certificate (interim or permanent). This requires attendance at two eight-month sessions in the College of Education (or only one session for those who hold a professional certificate and part of type B or type A of the elementary certificate).

4. To teach in collegiate institutes — specialist certificate. This demands a permanent intermediate certificate and three summer school sessions of 200 clock hours each.

The government pays a maximum annual grant of $200 to each center (school) where instruction is given in industrial arts and crafts in an approved manner by a qualified teacher. It also pays 50 per cent of the expenditure on approved equipment, to a maximum expenditure of $2,000. For vocational instruction, the grant is based on the total amount of the salaries of all the teachers in the school who teach pupils who are taking the vocational course or who teach vocational work to pupils taking a general academic course. The government grants on such bulk salaries are as follows: Ninety per cent on the first $20,000; 80 per cent on the next $20,000; 70 per cent on the next $20,000; 60 per cent on any further amount.

The several phases of work are under a director of technical education in the department of education, who also has charge of household economics for girls and commercial work for both sexes. There are two inspectors for the elementary industrial-arts and general-shop work, and two inspectors for the vocational shopwork. These inspectors act as organizers and supervisors, visit schools, and report to the director on the teachers and their work.

British Columbia

British Columbia has a land area of 359,280 square miles and an approximate population of 1,082,000; has a large part of its school population concentrated in the city of Vancouver.

It was one of the first provinces to adopt the organization of grades 7, 8, and 9 as an educational unit, commonly known as the junior high school. The use of the term elementary is confined to the grades below 7; the grades above 9 are known as the senior high school. Both junior and senior high are considered secondary schools. The actual senior high school may be of academic, technical, or composite type, depending upon the nature of the principal courses therein.

Shopwork, with its associated studies, is known as industrial arts in all schools, but in the senior high school some of the work is more specialized and known as vocational work. The subjects of instruction in the junior high school are woodwork, metalwork, electrical work, and drafting. In the senior high school, the shop subjects are of the same type, with the addition of farm mechanics. The student makes a choice of three shops out of four and spends five class periods (40 minutes) per week in each, including the drafting for each subject. The time spent by students taking vocational work varies but is often much more.

It is possible to get junior matriculation (University entrance) in a technical or composite high school and also get the benefit of the shopwork, drafting, and special science. For those who desire more comprehensive technical and vocational training (without a foreign language), there is a technical diploma course (completed in grade 12) with major options in either electricity, sheet-metal work, machine-shop work, printing, commercial art, motor mechanics, building construction, mining or lumbering.

The teaching certificates required for industrial arts are: (1) For instructors in elementary schools or junior high schools — junior high school industrial-arts certificate. (2) For instructors in senior high schools — senior high school industrial-arts certificate. (3) For instructors in vocational shopwork — vocational A (permanent) or vocational B (interim, for 5 years).

Teacher training for all certificates may be obtained by attending a number of summer school sessions in craftwork and pedagogy at the Vancouver Technical School. Those eligible to attend may be either teachers with first-class or Academic-professional certificates, or experienced mechanics. The applicants for industrial-arts teacher training must be high school graduates and have taken junior and senior courses in drawing, woodwork, and metalwork, and a junior course in electricity.

There are 127 teachers of industrial arts in the secondary schools and 37 in the elementary schools. In the elementary schools, and in some secondary schools, one instructor teaches all phases of the work in one room known as a general shop, but in most schools the work is divided between two or more instructors who teach different subjects in their respective shops.

The government grants for teachers are the highest in Canada. There is a graduated scale, based on years of service and the type of certificate held. The minimum salary grant is $1,100 for starting teachers holding the lowest certificate, and the maximum is $2,240 for those holding the

highest certificate after 14 years of service. The school boards make up the difference between the grant and the contract salaries of the teachers.

In addition, for the school boards, there is an expense grant of $20 per pupil per year in grades 7–9, and $23 in grades 10–13; and a supervision grant of $1 per pupil per year for 7–9, and $2 for 10–13. The government also pays 50 per cent of the capital cost of the equipment for ordinary industrial arts. For vocational work, the equipment grant is 70 per cent, with an additional $200 per year for each teacher who spends all his time on such work, and an addiitonal expense grant of $20 for each pupil who does the same.

The organization and supervision of all industrial-arts and vocational work is under a director of technical education, with the assistance of a special inspector of technical classes.

The Province of Quebec

This province has a land area of 523,600 square miles and an approximate population of 3,792,000. It is the largest in the Dominion and has the second largest population.

There are two kinds of common schools in Quebec, based on differences of religion and mother tongue. The Council of Education has a Roman Catholic committee and a Protestant committee, each of which controls the curriculum and organization of its own schools under the department of education. For the Roman Catholic majority, most schools are taught in French, and many of the teachers belong to religious orders. For the Protestant minority, approximately 395,000, almost all of the schools are taught in English by lay teachers. The Protestant schools are mostly in Montreal, the largest city in Canada, and near-by townships, but there are many schools in other scattered areas.

In the Roman Catholic schools, the boys' handwork is called travaux manuels. It is an optional subject of instruction from the 6th to the 9th years of the primary schools. Woodwork is done in all these grades, with the addition of wood finishing in the seventh year, sheet-metal work in the eighth year, and electrical work in the ninth year. In grade 8, instruction in wood and metal is combined but in grade 9 the work in wood and the electrical work are taken alternately. Mechanical drafting is a part of the work in each year. The drawings of the objects to be made are done on squared paper, either in orthographic or isometric projection or in development. From 10 to 12 definite projects in regular order are prescribed for each year. The designs for these, and books of instruction for teachers, are issued by the department of education. The time devoted to the work is one hour per week in the sixth year, one and a quarter hours in the seventh, and one and a half hours each in the eighth and ninth years. Separate rooms are recommended for the pupils' benchwork, for preparation and demonstration, and for drafting. The number of pupils to be taught by one teacher is thirty, which is much higher than anywhere else in Canada and can only be managed by giving class instruction on prescribed projects.

The government pays from $500 to $1,000 per center for the establishment of Travaux manuels, varying according to the cost of equipment and other expenditures incurred by the local authority. There are at present 8 centers in the city of Quebec and 95 other centers in the province which provide instruction for boys in grades 6, 7, 8, and 9.

The government also provides free instruction for teachers who attend summer school classes in Travaux manuels and makes a grant toward paying for the board and lodging of those who do not live at the place of instruction. A certificate is granted only after attendance at the summer sessions for three years but those teachers who undertake to attend for three years are allowed to teach the subject after the first year. Over one hundred teachers have been trained in this way and by the end of this summer (1948) there will probably be one hundred more.

Centers of instruction for Travaux manuels were not authorized officially for Catholic schools until 1947, so there is much ground to be covered. As a result of educational propaganda of many sorts, the movement is spreading rapidly and many school authorities are now asking permission to establish centers. The direct cause of the awakening interest was the successful establishment of an experimental center at the school of St. Charles de Limoilou, Quebec city, in 1941, with the sanction and help of the Department. This has been used as a demonstration center and has been visited by a large number of interested and influential people. The work of propaganda, organization, direction, and inspection for Travaux manuels is in charge of two special officers of the department of education who report to the superintendent.

Travaux manuels as carried on by the department of education provides only for the period of compulsory school attendance. There are schools of arts and crafts and technical schools which operate under the Ministry of Social Welfare and Youth to provide avocational and vocational instruction for adolescents and adults of any religious denomination. For admission to a school of arts and crafts, the pupil must be above grade 7, and not less than 14 years of age. To enter a technical school, the student must be in grade 9, or higher, and be at least 16 years of age.

In the Protestant schools, manual training has been carried on in some centers since it was started under the Macdonald Fund in 1900. A greatly extended course, now known as industrial arts, is authorized as an optional subject in grades 6 and 7 of the elementary schools and grades 8 to 11 in the high schools.

The elementary schools have woodwork in grade 6 for one and one-half hours per week, and woodwork and home mechanics in grade 7 for two hours per week. The home mechanics consists of handy-man work connected with mechanical fittings in the home.

In the high schools, two main shop subjects are taken in each grade, usually for one and one-third hours each. The work in each course is outlined in detail for each grade, with many prescribed operations and suggested exercises. Technical drawing must be taken in each grade where facilities exist.

Woodwork and metalwork are taken in grades 8 and 9. The metalwork in grade 8 consists principally of sheet-metal and art-metal work, with some minor work such as ironwork, wirework, spinning, and casting. The metalwork in grade 9 consists of sheet-metal work and bench and machine-shop work, with some other work such as ornamental ironwork. In grade 10, motor mechanics is taken with the metalwork, which includes forging. In grade 11, practical electricity is taken with benchwork, machine-shop work, and welding. The work is nearly all done in general shops.

There are 35 specialist teachers of industrial arts in the Protestant schools, most of whom teach both elementary and high school grades in any or all shop subjects. Special certificates are given to teachers who are able to show the central board of examiners that sufficient training has been taken and that their academic standing is sufficiently high. Male teachers of industrial arts are advanced two years on the salary scale for elementary teachers when appointed. Teachers who spend more than half of their time with high school classes are placed on the high school scale. The government pays a maximum grant of $800 per annum for each full-time qualified instructor.

The work comes under the director of Protestant education, who is also English secretary in the department of education.

(To be continued)

Teaching Materials for Industrial Education

CHRIS H. GRONEMAN
Industrial Education Department
Agricultural and Mechanical College of Texas
College Station, Tex.

(Continued from page 405 of the December, 1948, issue; for complete directions when ordering films refer to page 270 in the September, 1948, issue)

Films — Transportation

Tractor Care on the Farm Front — 16mm. — sound — 8 min. — 50 cents (rental)
Your Driving Habits — 16mm. — sound — 15 min. — $1.50 (rental)
(Many additional films for rental are available; for more complete listing write to the Bureau of Visual Education, University Extension Div., Madison 6, Wis.)

Wood

American Forest Products Industries, Inc., 1319 — 18th St., N.W., Washington 6, D. C.
Trees for Tomorrow — 16 or 35mm. — sound — 18 min.
A Bibliography of Study Aids — Our Forest Resource and its Conservation

Bray Studios, Inc., 729 Seventh Ave., New York 19, N. Y.
Wood Fabrication (airplane): *Building a Wooden Rib* — 16mm. — sound — 2 reels — $2.50 (rental)
Building a Box Beam Spar — 16mm. — sound — 2 reels — $2.50 (rental)
Wing Assembly — 16mm. — sound — 2 reels $2.50 (rental)
Wing Assembly, Inboard Panel — 16mm. — sound — 2 reels — $2.50 (rental)
Wing Assembly, Bow Tip — 16mm. — sound — 2 reels — $2.50 (rental)
Laying Out and Forming Plywood — 16mm. — sound — 2 reels — $2.50 (rental)

Castle Distributors Corp., Div. of United World Films, Inc., 135 S. LaSalle St., Chicago 3, Ill.
Trees for Tomorrow — 16mm. — sound — 18 min.
Catalog: *Movies for Every Occasion*

Chicago Tribune, Tribune Tower, Chicago, Ill.
Trees to Tribune — 16mm. — sound

Homasote Co., Trenton 3, N. J.
A City Comes to Alexander's Corners — 16mm. — sound — 90 min. — color
How to Build a House in 78 Minutes — 16mm. — sound — 30 min. — color
A City Rises Overnight — 16mm. — sound — 60 min. — color
Film Catalog

International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill.
International Logging — 16mm. — 9 min.
From Trees to Lumber — 16mm. — 10 min.
Cold Facts About the Northland — 16mm. — 10 min.
Save Those Tools — 16mm. — 10½ min.

Kansas, University of, Bureau of Visual Instruction, University Extension Division, Lawrence, Kans.
Alaska — 16mm. — sound — 1 reel — $1.50 (rental)
Operation of a Forest Nursery — 16mm. — sound — 1 reel — 50 cents (rental)
Pineways to Profits — 16mm. — sound — 2 reels — 50 cents (rental)
Stop Forest Fires — 16mm. — sound — 2 reels — 50 cents (rental)
Tree in a Test Tube — 16mm. — sound — 1 reel — 50 cents (rental)
Tree of Life — 16mm. — sound — 2 reels — 50 cents (rental)
Trees to Tame the Wind — 16mm. — sound — 1 reel — 50 cents (rental)
Trees to Tribunes — 16mm. — sound — 3 reels — 50 cents (rental)
Marking Timber — 16mm. — silent — 2 reels — 60 cents (rental)
World of Paper — 16mm. — silent — 2 reels — 60 cents (rental)

Southern Pine Association, New Orleans 4, La.
Your Post-War Home — 35mm. — slide film — sound — 15 min.

Western Pine Association, 510 Yeon Bldg., Portland 4, Ore.
Harvesting Western Pines — 16mm. — sound — 30 min.
Fabricating the Western Pines — 16mm. — sound — 35 min.
Building a Home with Western Pines — 16mm. — sound — 25 min.

Weyerhaeuser Sales Co., First National Bank Bldg., St. Paul, Minn.
Trees and Homes — 16mm. — sound — 3 reels

SAMPLES

Handcraft

Columbian Rope Co., Auburn, N. Y.
Educational Display which contains the pamphlets listed here and a few additional blotters and folders:
Rope Knowledge for Scouts
How Columbian Pure Manila Rope is Made
How to Wrap and Tie Packages
Story of Manila Fibre
Story of Sisal Fibre

Industrial and General

American Viscose Corp., 350 Fifth Ave., New York 1, N. Y.
(VK) *Viscose Process Kit* — 50 cents
(AK) *Acetate Process Kit* — 50 cents

Association of American Railroads, Transportation Bldg., Washington 6, D. C.
Teacher's Kit — Railroad Transportation (available to teachers only) — includes 56 photographs plus *A Study of Railway Transportation*, Volume 1 and Volume 2, for primary and intermediary grades

Bituminous Coal Institute, 815 Southern Bldg., Washington 5, D. C.
*Coal By-Products Package**
*Science Coal Kit Package**

Pepperell Manufacturing Co., 160 State St., Boston 2, Mass.
Display kit — *Cotton From Plant to Product*

Pequot Mills, Empire State Bldg., New York 1, N. Y.
The Story of Pequot — with samples of raw cotton and finished sheeting

Plymouth Cordage Co., North Plymouth, Mass.
Rope Knot Display Posters

Strathmore Paper Co., West Springfield, Mass.
Artist Paper and Boards

United States Gypsum Co., 300 West Adams St., Chicago 6, Ill.
Display including jars holding small samples of gypsum rock and limestone and various materials manufactured from them, including wallboard

United States Mineral Wool Co., General Offices, South Milwaukee, Wis.
Granulated, semigranulated, and loose mineral wool

Metal

E. C. Atkins and Co., 402 South Illinois St., Indianapolis 9, Ind.
Atkins Silver Steel Practice Filing Strips — 9 by 2 in., toothed one edge, 6-point rip teeth, the other edge 8-point crosscut teeth. A 1-in. section at the end of each pattern tooth is filed and set correctly as a guide for the student to follow. Per dozen, net, $2.11.

Plastics

American Plastics Corp., 225 West 34th St., New York 1, N. Y.
Educational Sample Kit containing raw casein sheets and rods, and also finished products made from "Ameroid" — $1

Transportation

Douglas Aircraft Co. Inc., 3000 Ocean Park Blvd., Santa Monica, Calif.
Packet of pictures of the better known Douglas airplanes

Wood

Hammermill Paper Co., Erie, Pa.
Hammermill Education Packets and Exhibits:
Student's Packet — booklets — 10 cents
Teacher's Packet — booklets, lesson plans, wood and pulp samples — 15 cents
Classroom Exhibit — booklets, sample books, and bottled exhibit of wood and pulp samples — 25 cents

*One set each, gratis, to any teacher; more than 1 set, 20 cents per box, or 40 cents for the set.

Hammer Laboratories, 624 Monaco Blvd., Denver 7, Colo.
Set of five phosphorescent paints — $1 postpaid
Set of five fluorescent paints — $1 postpaid

Card, with inch-square plaques showing each of ten colors above — 25 cents
Masonite Corp., 111 West Washington St., Chicago 2, Ill.
Samples of Presdwood and Tempered Presdwood (please specify thickness 1/8 in., 3/16 in., 1/4 in., 5/16 in.)
United States Plywood Corp., 55 West 44th St., New York 18, N. Y.
Sample of Plywood

(The end)

Problems and Projects

SMOKER'S STAND FOR A DESK SET

FRANKLIN H. GOTTSHALL
Boyertown, Pa.

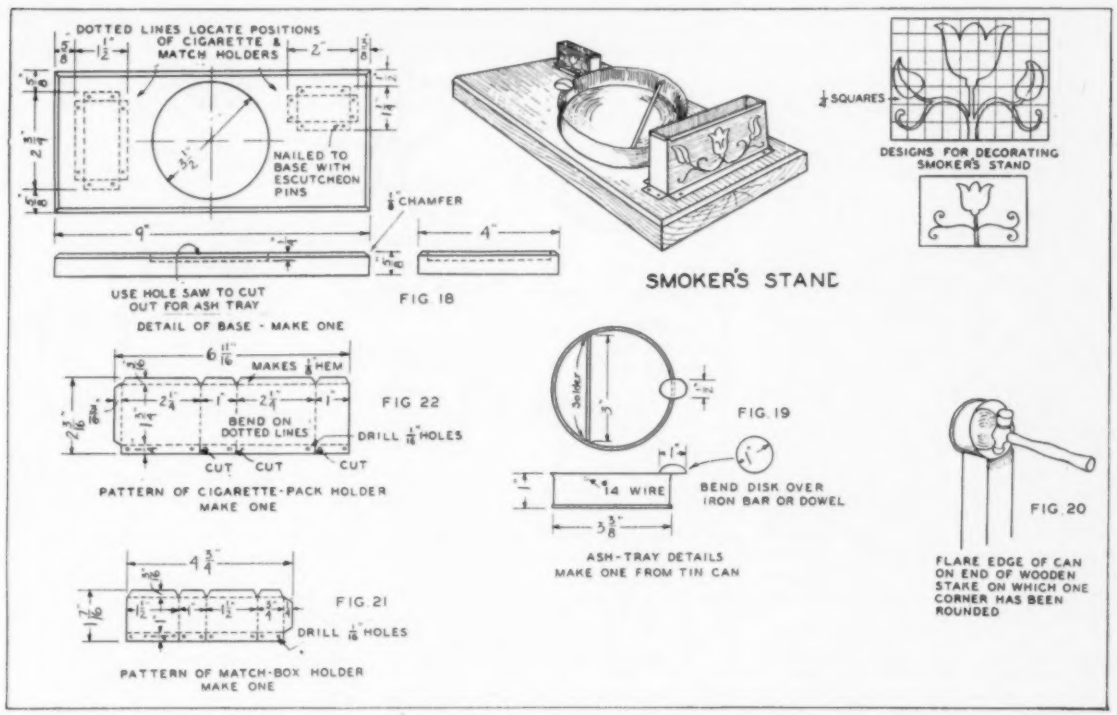
This is the fourth and final article in a series of projects designed for a boy's room, to be used on his desk or writing table. The other three articles in the series were published on page 206 in the May, 1948, issue, page 280 in the September, 1948, issue, and page 319 in the October, 1948, issue. As in the case of the other projects, the materials may be salvaged from tin cans and packing box lumber. The project is quickly made, and for that reason is a good shop project. It may be decorated either in the shop, or in the art class.

MATERIALS REQUIRED

No. of pcs.	*Name*	*Material*	*Size*
1	Base	Wood	5/8 x 4 x 9 in.
1	Ash tray	Tin, base of a 3 1/4-in. diameter can	
1	Cigarette holder	Tin, disk	1 in. in diameter
1	Cigarette-pack holder	Tin	2 3/8 x 6 1/16 in.
1	Matchbox holder	Tin	1 7/8 x 4 3/4 in.
1	No. 14 wire, 3-in. long		
16	No. 18 escutcheon pins		
	Solder		
	Enamels		

Procedure

1. To make the base, secure a piece of wood and plane and square it to the sizes given in


DOTTED LINES LOCATE POSITIONS OF CIGARETTE & MATCH HOLDERS
NAILED TO BASE WITH ESCUTCHEON PINS
1/8" CHAMFER
USE HOLE SAW TO CUT OUT FOR ASH TRAY
DETAIL OF BASE - MAKE ONE
FIG. 18
SMOKER'S STAND
1/4 SQUARES
DESIGNS FOR DECORATING SMOKER'S STAND
MAKES 1/8" HEM
BEND ON DOTTED LINES
DRILL 1/16" HOLES
CUT
PATTERN OF CIGARETTE-PACK HOLDER MAKE ONE
FIG. 22
Solder
FIG. 19
14 WIRE
BEND DISK OVER IRON BAR OR DOWEL
ASH-TRAY DETAILS MAKE ONE FROM TIN CAN
FIG. 20
FLARE EDGE OF CAN ON END OF WOODEN STAKE ON WHICH ONE CORNER HAS BEEN ROUNDED
DRILL 1/16" HOLES
PATTERN OF MATCH-BOX HOLDER MAKE ONE
FIG. 21

Details of smoker's stand

Figure 18. The round hole which holds the ash tray was cut with a hole saw mounted on a drill press, and then chiseled out.

2. To make the ash tray, cut the base out of a can which is 3⅜ in. in diameter. Make its sides 1 in. high, as shown in Figure 19. The sides are flared out at the top by hammering the edge over the rounded corner of a wooden stake held in a vise, as shown in Figure 20. Cut a 1-in. diameter disk and shape it as a cigarette holder over a ½-in. round mandrel. Solder the cigarette holder to the ash tray as shown in Figure 19.

3. To make the cigarette pack holder, make the paper pattern shown in Figure 22, and transfer it to the tin with a sharp scriber. Cut it to shape with the tin snips.

4. Turn the ⅛-in. hem at the top. Drill the 1/16-in. holes, then make right-angle bends at the bottom to form the flanges by means of which the pack holder is nailed to the base.

5. Form the pack holder over a wooden block cut to the size and shape of the holder. Bend the flap and solder the joint.

6. Make the matchbox holder by following the steps given to make the pack holder.

7. Fasten the pack holder and matchbox holder to the base with brass escutcheon pins.

8. Paint and decorate the project.

INDIAN SILVERSMITHING

BEN HUNT

Hales Corners, Wis.

(Continued from page 77 of the February, 1949, issue)

Lapel Pins

On a recent trip through the southwest we saw an excellent display of lapel pins in the Aztec Ruins Trading Post at Aztec, N. Mex. Through the courtesy of Mrs. Caroline Kirk, permission was obtained to photograph some of them for the readers of this series of articles. Plate 34, and the accompanying half tone, tell the story fairly well but a little explanatory matter is nevertheless in order.

Let us start with the frog shown in the half tone. The base includes the body and legs. To make this frog, saw out the base and stamp it. The webbed feet were stamped out with a blunt, rounded stamp, and finished with a small round or half round file. The large bezel is soldered onto the base. The sketch in the upper left-hand corner of Plate 34 shows how the head is fastened. The head is shaped and the eye bezels are soldered in place. Then the little piece of angle silver is soldered to the head and then to the under part of the body, leaving enough room for the body, consisting of the large turquoise. The upright part of the angle piece can be bent out of the way when setting the large stone. It must then be bent back into its former position.

In making the large butterfly, the wings are made in one piece. The body is made of sheet silver, stamped and then bent over a piece of round metal and soldered. In bending the wing piece see that it fits the body. The wings are bumped up quite a bit. The head is a large solid raindrop and the eyes are small raindrops.

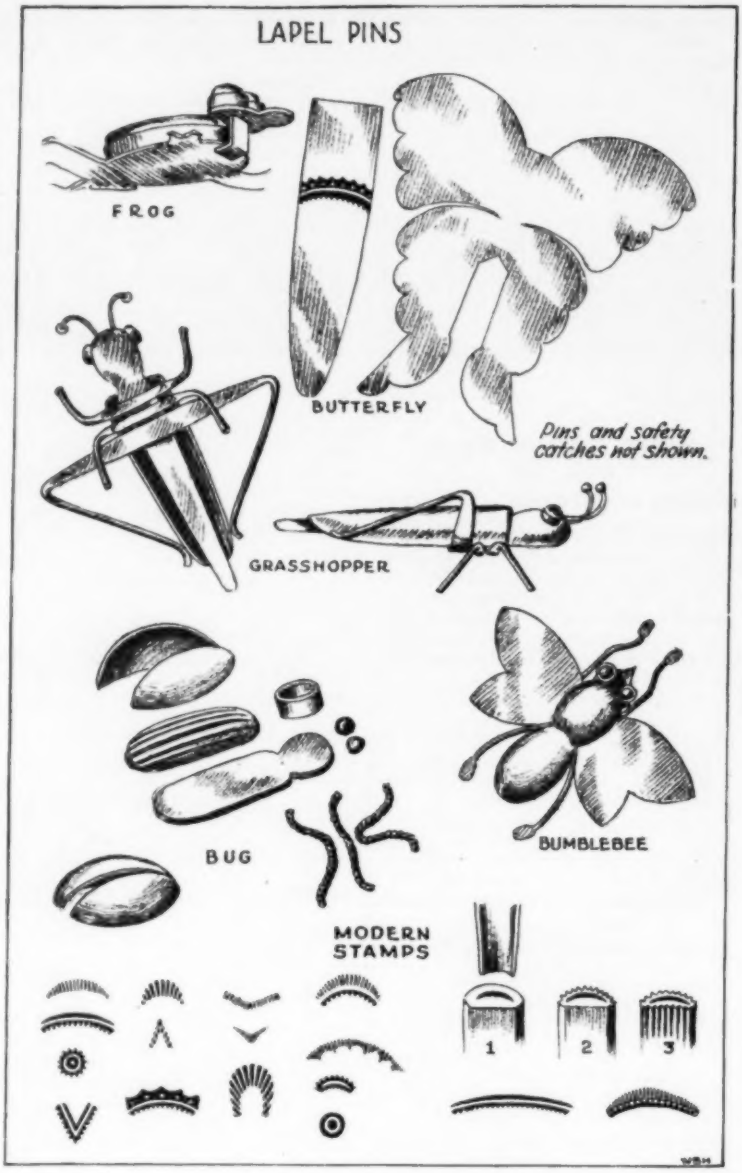
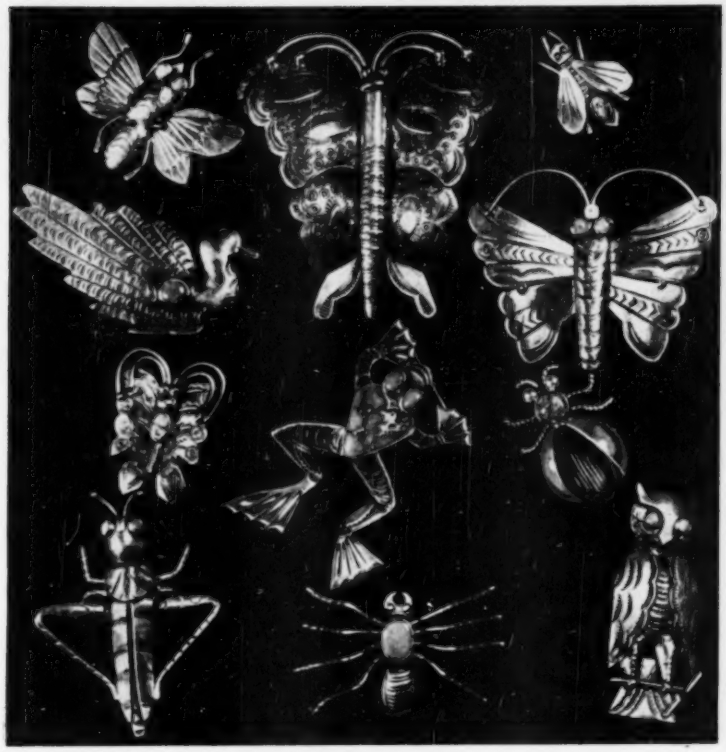


Plate 34

The grasshopper is made up of 14 pieces, which make quite a job of the soldering, but when the whole piece is finished, it makes a beautiful pin. The sketches show how the bottom looks and also how the legs are bent and attached. Turquoise stones are used for the eyes.

The bumblebee was made quite simply. The wings and bottom of the body are all in one with the domed-up body soldered to the base. Of course, the stamping is done before the forming. The middle-sized butterfly to the right of the large one is simplified still more. The body and wings are of one piece. The body is bumped up, the forward wings are bumped up slightly, and the back wings are bumped down. It was made of 24-ga. silver, and a raindrop was soldered between the wings to hold them more rigid. The eyes are small turquoise and the nose is a raindrop.

The large bug to the right of the frog is a



Indian pieces photographed through the courtesy of Dean Kirk, Aztec Ruins Trading Post, Aztec, N. Mex.

little more complicated, as shown by the sketches in Plate 34. These bugs may be made without turquoise, a domed piece of silver taking the place of the stone. The wings are made by cutting a domed circular piece almost in two down the middle.

The rest of the pieces are rather easily made. The owl's wings are sweated onto the body and the beak and ear pieces are sweated onto the head.

The pieces of silver work shown in the half tone are fine examples of modern Indian silversmithing. The stamps are modern also. They are so interesting that the author has sketched some of them on Plate 34. The stamps with the *open* center can be made by stamping. Of course, annealed tool steel must be used, and it must be gripped tightly in a good stout vise with only a little of the steel above the jaws to prevent it from springing. Then an ordinary stamping tool is used, but it will require several blows with the hammer, so be sure the stamp fits into the depression exactly, before hammering.

Many of the modern stamps, like those shown, are quite tricky and delicate, and most likely are not made by Indians. If they are, the work was done in the Indian schools. The stamps, however, work out very well in the hands of Indians.

GAFF HOOK

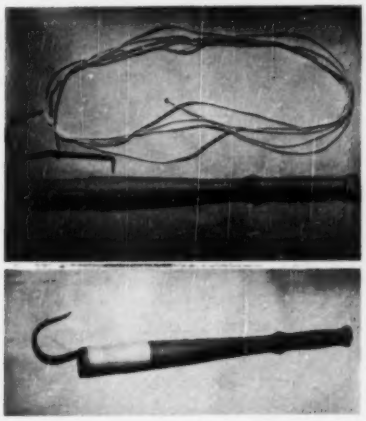
ARTHUR W. TESSMER

Public Schools

Ketchikan, Alaska

For many years this project has annually been constructed in the school shop with interest never lagging from year to year. The idea originated from the gaff hooks used by local commercial salmon fishermen. They represent an important item in the sport or commercial fisherman's gear. Hence the profound interest shown in the project.

The advanced student has a chance to use his initiative and originality whereas the project lends itself equally well to construction by the beginner. From the standpoint of instruction, an added value comes from the fact that if the beginner unintentionally alters a dimension here or there, the efficacy of the finished article most likely has not been diminished.



The necessary parts, and the finished gaff

Bill of Material

One piece hardwood 1¼ by 1¼ by 22.

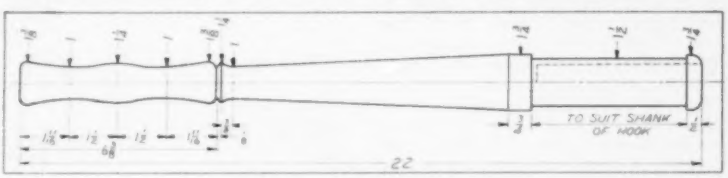
The handle is made of any hardwood, with birch being very satisfactory. The metal hooks in varied sizes can be purchased at sporting goods stores, or they may be made in the school shop.

A recess is turned near the front end just sufficiently deep to accommodate the wrapping and give an over-all flush appearance. The length of the recess is naturally dependent on the length of the metal shank. A small hole is drilled in the handle end of the recess into which is driven the turned down point of the shank. A dado to accept the shank of the hook can be cut on the circular saw, or on the shaper.

Before removing the lathe fittings on the handle it is a good idea to raise the grain of the wood by immersing in water. After drying, the raised grain is sanded off with No. 2/O sandpaper. This operation is repeated two or three times or until immersion fails to raise any more of the grain. A waterproof oil finish can be made of equal parts of shellac, vinegar, and boiled linseed oil. This gives a high polish and a natural finish to the wood.

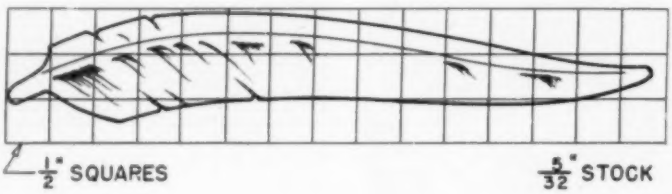
A wrapping of heavy cord serves to hold the handle and hook together. This cord can be waterproofed by applying one of various commercial agents.

This gaff hook differs somewhat from the usual *store-bought* types in that it may be used as a club, with hook up, to kill the fish.



Details of gaff

A FEATHER LETTER OPENER



① CUT BLANK OF METAL OR PLASTIC.
② TRANSFER DESIGN TO BLANK.
③ CUT TO SHAPE.
④ SMOOTH ALL EDGES.
⑤ FILE SURFACE TO PROPER FORM.
⑥ SMOOTH SURFACES.
⑦ ETCH, ENGRAVE, CHASE OR CUT LINES.
⑧ BUFF AND POLISH.
⑨ LACQUER, IF NECESSARY.

Letter opener designed by Thomas A. Harris, College Park, Md.

COLONIAL CANDLEHOLDERS

AUGUSTINE J. BREZINA
Oswego, N. Y.

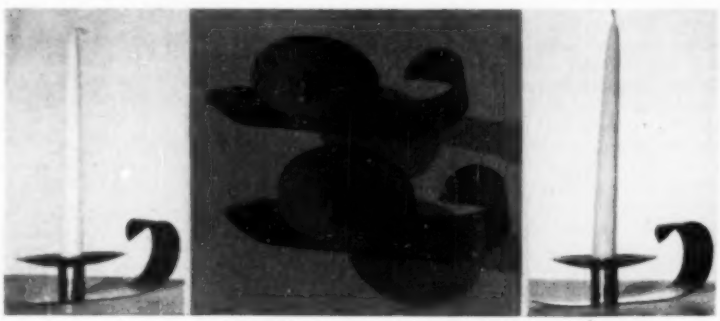
This set of interesting copper candleholders is not only useful as a serviceable household article, but possesses artistic values as well. An over-all peened surface serves to enrich its beauty and reflect the metallic luster when the candle light plays on the peened facets.

The main, or base part of the candleholders is made of 17 B&S Gauge (.043) copper for added rigidity, since one end of the base serves as a handle. The candle receptacle, and drip cup may be made of a lighter gauge (20 gauge) for ease of operation.

Begin by making the receptacle and the drip cup. The receptacle is fabricated from a piece of hammered copper, and a base is then soldered on to complete the job. The drip cup is made from a disk 4 in. in diameter, peened all over. In the hammering process the edge of the disk is first peened or scalloped with a large ball-peen hammer. This scalloping or deckling adds to the general attractiveness of the rim. For the over-all peening choose a medium sized hammer, and peen the surface working in concentric circles from the outside toward the center. As a result of the peening, a rough, concavelike dish will result. To complete the desired concave shape of the drip cup, use a hardwood form block and a wooden mallet. If difficulty is encountered in the final shaping of the drip cup it may be wise to anneal it, and then continue with the forming process. The center section of the drip cup is then cut out and filed to make a fit for the receptacle, which is then soldered to the rim from the underside. This is followed by polishing, buffing, and applying two coats of protective lacquer. This unit is then complete and ready to be riveted to the base.

For the base section a piece of 17-gauge copper, 1¾ by 12 in., will be required. Each end is tapered as shown. Remove all the tool marks and scratches before applying the hammered finish. For the edge decoration use a large ball-peen hammer. It is highly desirable that these edge deckles or peen marks overlap just enough to maintain uniformity throughout the two bases. Then peen the entire base, beginning at one end and working toward the other. During this process it will be found that the metal will have a slight tendency to curl up as a result of the hammer blows. This situation may be rectified by flattening with a mallet from the reverse side. Although it is sometimes recommended that a piece of metal at this stage should be annealed because of curling, it is advisable to finish the peening in one setting. Through experimentation with hammered work it was found that annealing in the midst of peening or planishing would tend to produce a two-tone variety of hammer marks. This is due to the dead softening of the material after annealing and consequently larger less defined peen marks result, depreciating the artistic value of the project.

The peening is continued to the point where the base is to be turned upward to form the handle. Then reverse it and continue the hammering on the reversed side to the end. The reason this is done is to present the best possible surface on the outside visible portions of the handle, after it is formed into the scroll shape. Peening on one side only would show up the flat underside of the hammer blows after the handle scroll was fashioned,



Colonial candleholders

as the bottom of the base end actually becomes the top after the handle is formed.

After the base is finished, drill a ⅛-in. hole where the cup is to be riveted to the base. Locate the hole 3½ in. from the end. The drilled hole is then dimpled. Dimpling is a somewhat similar process to countersinking, except that instead of removing material as with a countersink, the metal is bent or formed to take the head of the rivet. Dimpling is usually used where thin metals are used and it is desirable to make the rivet flush with the surrounding surfaces. Any cone shaped tool such as a large center punch may be utilized as a dimpling tool. Lay the base on a piece of wood with the hole over a small cavity, and then tap the dimpling tool in the hole until the desired effect is obtained. The base of the candle cup is also dimpled in a similar process.

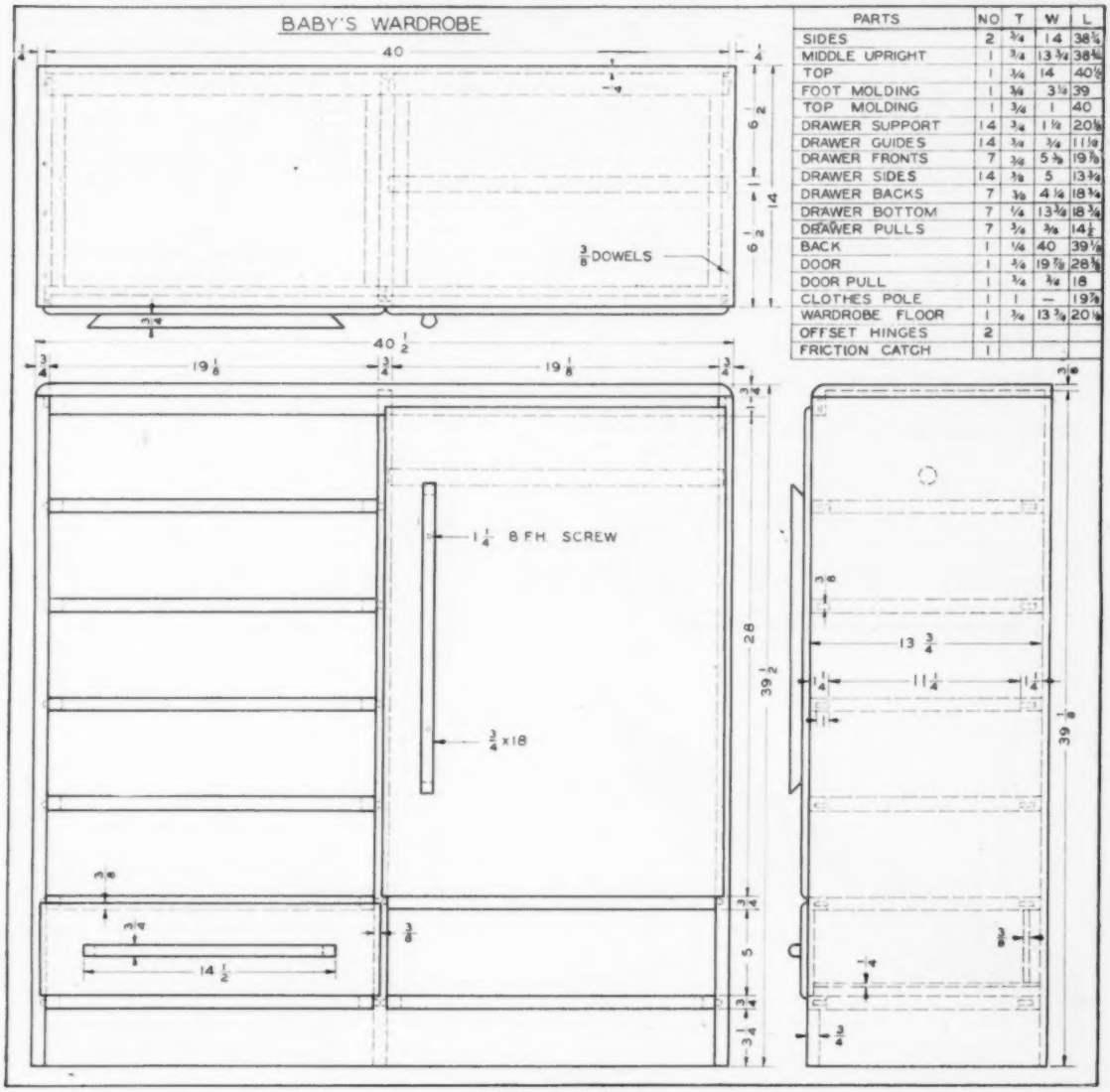
The base is then polished, buffed, and the handle formed, after which two coats of protective lacquer are applied. Soldering the cup to the base was purposely avoided, not only because it is troublesome to work in a confined area, but also because the heat of soldering might stain the finish. By riveting the project, the two parts may be completely finished separately and more easily. Thus the polished lacquered parts may be handled safely without leaving smudges while riveting.

As an alternate finish, the parts may be given the customary antique finish associated with early colonial type candleholders, by using liver of sulphur, and then high-light with fine steel wool.

BABY'S WARDROBE

R. E. JENNINGS
San Benito County High School and Junior College
Hollister, Calif.

The wardrobe satisfies the need for more drawer space, having smaller drawers rather than the common larger drawers.



PARTS	NO	T	W	L
SIDES	2	¾	14	38¾
MIDDLE UPRIGHT	1	¾	13¾	38¾
TOP	1	¾	14	40½
FOOT MOLDING	1	¾	3¼	39
TOP MOLDING	1	¾	1	40
DRAWER SUPPORT	14	¾	1½	20⅛
DRAWER GUIDES	14	⅜	⅜	11⅛
DRAWER FRONTS	7	¾	5⅛	19⅛
DRAWER SIDES	14	⅜	5	13¾
DRAWER BACKS	7	⅜	4¼	18¾
DRAWER BOTTOM	7	¼	13⅜	18¾
DRAWER PULLS	7	¾	⅜	1½
BACK	1	¼	40	39⅛
DOOR	1	¾	19⅞	28⅛
DOOR PULL	1	¾	¾	18
CLOTHES POLE	1	1	—	19⅛
WARDROBE FLOOR	1	¾	13¾	20⅛
OFFSET HINGES	2			
FRICTION CATCH	1			

Baby's wardrobe

As an added feature a smaller drawer may be placed inside the top drawer for pins, etc. This drawer should be one half the original drawer size, so that it can slide back and forth on ¼ by ¾ by 13-in. guides, and still make the drawer accessible.

The wardrobe is large enough for girls' dresses and small boys' suits, and still have room for shoes below.

MAKE YOUR OWN "VAPOR-TYPE" BRUSH KEEPER

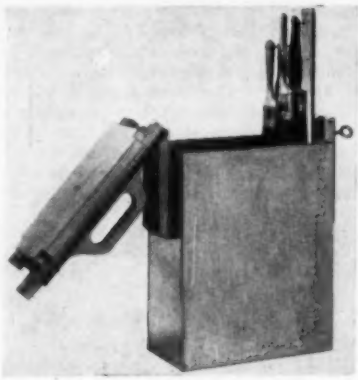
E. KURATH

Chemical Science Department

West Division High School

Milwaukee, Wis.

You can make a Vapor-Type brush keeper in the school shop. It will be a most useful piece of equipment for the school shop, as well as for the home. This brush keeper provides the most satisfactory method yet discovered for keeping paint brushes ready at all times.



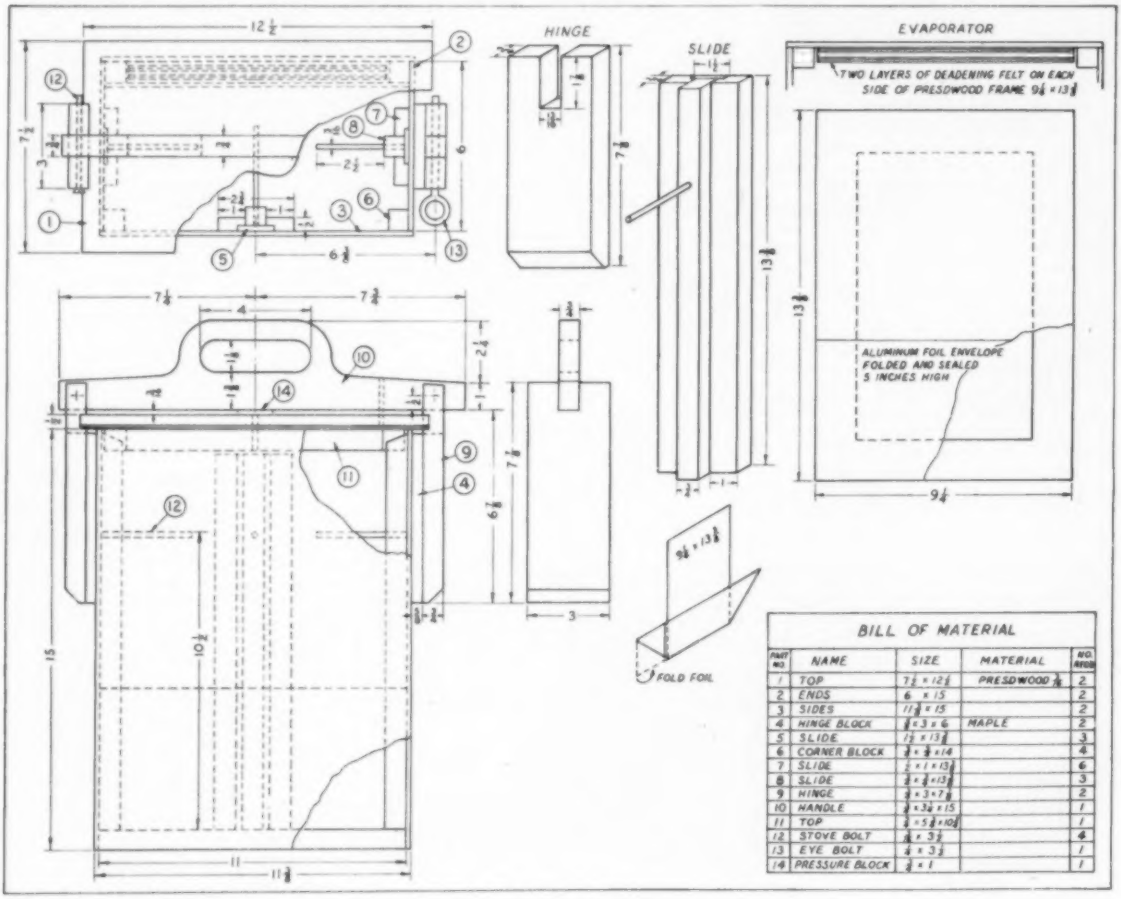
Vapor-type brush keeper

The brushes are suspended in a vapor solvent obtained by the evaporation of a specially prepared liquid. This liquid consists of a balanced mixture of a number of paint solvents. The vapor penetrates into the brush, dissolves the binder in the finishing material, and keeps it soft in the brush. Hardened paint will be softened after several days when exposed to the vapor, so that the brush can be washed out easily. Brushes that have been hard for years can be reclaimed perfectly by this method. The vapor has no deteriorating effect on the bristle or the setting of the brush.

This brush keeper will save valuable time for both student and instructor. There is no time lost getting brushes ready. The student can get to work immediately and does not have to work oil or water out of the brush. More time is often spent getting ready than in the actual finishing operation.

Such a brush keeper must be airtight because the whole brush is stored in the container. The inside surfaces of this container are lined with aluminum foil in order to make it vaporproof.

The construction of the brush keeper is simple. The container can be made of plywood or pressed wood. The assembly is with screws. The aluminum foil is fastened with a cement


HINGE
SLIDE
EVAPORATOR
TWO LAYERS OF DEADENING FELT ON EACH SIDE OF PRESDWOOD FRAME 9¼ × 13⅜
ALUMINUM FOIL ENVELOPE FOLDED AND SEALED 5 INCHES HIGH
FOLD FOIL

BILL OF MATERIAL

PART NO.	NAME	SIZE	MATERIAL	NO. REQD
1	TOP	7⅞ × 12½	PRESDWOOD ⅛	2
2	ENDS	6 × 15		2
3	SIDES	11⅞ × 15		2
4	HINGE BLOCK	⅜ × 3 × 6	MAPLE	2
5	SLIDE	1½ × 13⅜		3
6	CORNER BLOCK	¾ × ¾ × 14		4
7	SLIDE	¾ × 1 × 13⅜		6
8	SLIDE	¾ × ¾ × 13⅜		3
9	HINGE	⅛ × 3 × 7⅛		2
10	HANDLE	¾ × 3½ × 15		1
11	TOP	⅛ × 5½ × 10½		1
12	STOVE BOLT	¼ × 3½		4
13	EYE BOLT	¼ × 3½		1
14	PRESSURE BLOCK	¾ × 1		1

Vapor-type brush keeper

which will adhere to the wood as well as to the aluminum and which will not be dissolved by the vapor solvent. This cement is also applied to the surfaces that are to be joined together with screws.

Three or more brush holders can be fastened to the inside of the container. Grooved slides permit the brushes on the rack to be lifted above the container. The desired brush may then be selected without disturbing the vapor surrounding the other brushes. If it is desired, one holder can then be reserved for shellac brushes, one for varnish, and one for enamel or paint. A combination cover clamp and handle makes the unit portable. The cover is made of material not likely to warp, such as pressed wood or plywood. Several layers of this material can be glued together with ordinary wood glue.

The gasket which seals the cover consists of several layers of deadening felt, used in building construction between sub and finish floors. These layers of felt are the full size of the cover and are held in position between the top cover piece and the lower piece which serves to center the cover on the container. The layers of felt are cemented together with the same cement used on the foil. A sheet of aluminum foil should be cemented to the lower layer of felt so as to provide a more perfect vapor seal between the upper edge of the container and the cover.

The wood used for the bottom should be carefully squared. A small chamfer should be cut around the upper edge before it is covered with aluminum foil. The aluminum foil should extend over the edges so that aluminum foil surfaces will be adjacent when the pieces are assembled. The chamfer will permit some cement to be flowed into the corners to form a perfect seal between the bottom and the sides.

In applying the foil to the pressed wood, the foil should cover one side completely. Apply three coats of cement, allowing the first and second coats to dry. Then apply the third coat, and when that begins to set, put on the foil, working out from the center to smooth it on the board. The foil may overlap the edges. After the cement has set firmly, trim the foil to the edges.

An evaporator is fastened to one of the wide sides of the container. Its purpose is to provide adequate evaporating capacity for the unit. Each brush stored will absorb a certain amount of vapor which it needs in order to remain conditioned. This evaporating surface must be there.

The evaporator consists of a pressed wood or wire frame around which several layers of deadening felt is wrapped. The lower part of this evaporator is then enclosed in an envelope of aluminum foil which is sealed and made tight with the same cement used to apply the foil. The frame will provide a space for the storage of some of the liquid solvent and will serve as a reservoir for the vaporizing liquid employed in the brush keeper. It is the evaporation of this solvent which makes this type of brush keeper work.

The upper edge of the container should be chamfered to a bearing surface of about ⅛ in. This edge may be covered with foil, or it may be glue sized to harden the edge and to fill in cracks or joints. Ordinary wood glue should be used for this purpose since it is not affected by the vapor in the container. Several coats of this glue may need to be applied. The upper edge of the container should be smooth as well as true.

A pressure block under the handle of the container can be adjusted to a size which will give the desired pressure on the cover.

The container illustrated in this description is an efficient size. If the opening at the top of the container is too large there will be too much vapor solvent lost every time the container is lifted. It is therefore better to have more brush keepers than to increase the size. However, the height of the unit can be increased without sacrificing efficiency.

The vaporizing solvent used in this brush keeper is the same as that supplied with the Protexem Brush Conditioner advertised elsewhere in this publication.

Suggestions for Assembling

1. Lay out the screw holes in the pressed wood sides. Drill and countersink. Holes spaced about 1¼ in. center to center.

2. Line the inside surfaces with aluminum foil.

3. Set the bottom on a true surface. Clamp it tight if possible. Screw the long sides to the bottom. Then fit ends and fasten to the bottom.

4. Cut corner blocks to length (within ⅛ in. of top edge). Screw sides to the corner pieces. Drill for screw holes in hard wood corners.

5. After the container has been assembled, remove the sides one at a time. Locate the sliding brush holder and fasten with screws. Apply sealing cement to the adjoining surfaces. Replace side before removing the next.

6. True and smooth the upper edge of the container for contact with the gasket.

7. Prepare hinge and spacer blocks. Fasten them to the ends of the container with screws.

8. Cut out handle.

9. Prepare cover (top piece), by gluing 2 pieces of 3/16-in. pressed wood together with ordinary wood glue. Fit lower cover block. Allow about ⅛-in. clearance all around. This helps center cover on gasket.

10. Cut 2 pieces of deadening felt to the full size of the cover (top piece). Cement aluminum foil on one side of one piece. Then cement felt to cover and cement the two layers together as well.

11. Place cover in position. Center properly. Lay handle across hinge blocks. Mark the position of the handle on the cover. Fasten handle to cover with one long screw coming up through the middle of the cover and into the handle.

12. Place a small pressure block about 3/16 by ¾ by 1 in. at the middle of the handle as shown. Drill holes for the hinge. Insert 3/16 by 3½-in. bolt. Increase or decrease the thickness of the pressure block so that the handle will be level when downward pressure is applied to the free end of the handle. Drill hole for eyebolt which will lock the cover.

13. After cover opens and closes smoothly, drill a hole in the handle. The hole must be large enough so screw fits loosely. Turn the screw into the cover. This will keep the cover from turning.

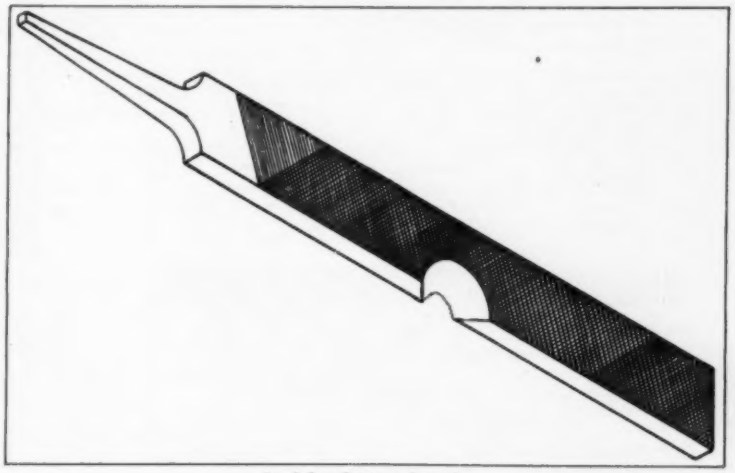
Special cement for applying aluminum foil can be obtained from Wisconsin Laboratories.*

*Write to E. Kurath, Instructor Science Dept., West Division High School, Milwaukee.

TOOL FOR FLUTING DOWELS

DAVID JANOWITZ
Industrial Arts Instructor
High School
Bergenfield, N. J.

As a precaution against splitting a doweled joint the dowel should be spiraled or fluted to permit the glue and air to escape.



Tool for fluting dowels

The tool that will flute the dowel is made of an old flat mill file of any size. Grind a curve with a bevel of about 40 degrees in the middle of the file to fit the shape of the largest dowel used in making a doweled joint as shown in the sketch. This tool will enable you to flute all sizes of smaller dowels.

To flute the dowels clamp this tool in a vise with the beveled side toward you. Draw the dowel stick across the tool toward you. Do this several times turning the dowel stick after each stroke. This method will make an efficient fluted dowel without reducing the diameter of the dowel.

AERONAUTICS*

WILLIAM E. NAGEL
Assistant Professor of Engineering
University of Wichita
Wichita, Kans.

(Continued from page 18A of the December, 1948, issue)

UNIT XI
Civil Air Regulations

I. Certification of pilots
  A. Grades of pilot certificates
    1. Aircraft pilot certificates
      a) Student
      b) Private
      c) Commercial
      d) Airline transport
    2. Glider pilot certificates
      a) Student
      b) Private
      c) Commercial
    3. Lighter-than-air-pilot certificates
  B. Requirements for pilot certificates
  C. Airman rating record
    1. Pilot aircraft ratings
      a) Aircraft type rating
        1) Airplane
        2) Autogiro
        3) Glider
        4) Lighter-than-air craft
    2. Special pilot's ratings
      a) Flight instructor's rating
      b) Instrument rating

II. Aircraft certification
  A. Airworthiness certificate
    1. Application — any registered owner
    2. Issuance — by administrator upon passing examination
    3. Duration — within sixty days and unless notified otherwise during that time, indefinitely.
    4. Canceled — by request of registered owner
    5. Transfer — remains with aircraft
  B. Registration certificate
  C. Aircraft operation record
  D. Identification marks
    1. NC
    2. NR
    3. NX
    4. Numerals only
    5. Location of marks
  E. Operation and maintenance of certified aircraft
    1. Permission to operate aircraft
    2. Solo flight
    3. Passenger flight
    4. Instructional flight
    5. Night flight
    6. Instrument flight
    7. Aircraft and engine log books
    8. Maintenance of certified aircraft
    9. Periodic inspection — every 100 hours
  F. Contact and instrument flight equipment
    1. Visual contact day flying
    2. Visual contact night flying
    3. Instrument day flying
    4. Instrument night flying
  G. Seaplanes and amphibious have the same rules applicable to land planes plus a rule that a life preserver for each person must be on the plane and a magnetic compass, and a white anchor light

III. Air traffic rules
  A. Flight rules
    1. Running of engines
    2. Take-offs and landings
    3. Right of way
    4. Proximity in flight
    5. Air traffic rules control
    6. Weather classification
    7. Minimum and maximum safe altitudes
    8. Lights and signals
    9. Parachutes
    10. Acrobatic flight rules
    11. Contact flight rules
  B. Instrument flight rules
    1. Equipment and fuel
    2. Weather minimums
    3. Flight plans
    4. Traffic control
  C. Designated areas
    1. Civil airways
    2. Control airports and control zones
    3. Flight zones
    4. Radio fixes
    5. Rang approach channel
    6. Emergency areas
    7. Restricted areas

*Other units on aeronautics in this series have appeared in the following issues: p. 253, June, 1946; p. 293, Sept., 1946; p. 414, Nov., 1946; p. 214, May, 1947; p. 392, Nov., 1947; p. 429, Dec., 1947; p. 27, Jan., 1948; p. 282, Sept., 1948; p. 381, Nov., 1948; and p. 422, Dec., 1948.

WORKSHOP HELD FOR TULSA INDUSTRIAL-ARTS TEACHERS

M. J. RULEY
Director, Industrial Arts and Vocational Education
Tulsa, Okla.

The industrial education department of the Tulsa public schools, under the direction of M. J. Ruley, director of industrial arts and vocational education, held a two weeks' session ironing out kinks and co-ordinating its city-wide program. The workshop conducted in co-operation with the curriculum department, under the direction of Dr. Jess S. Hudson, was scheduled from May 31 to June 11, 1948. Members of the group met for six hours each day, Monday through Friday, 8:00 to 12:00 noon, and 1:00 to 3:00 p.m., all groups meeting at the manual arts building as assigned.

On June 3 the workshop group attended an all day session of the State Industrial Arts Clinic held at Lake Blackwell, Stillwater. Dr. Chris Groneman was the guest speaker in the morning, and Dr. Frank of Frankoma Pottery, gave a demonstration in the afternoon. Some of the personnel attended the State T. & I. conference held at the same time.

Industrial-education instructors who participated in this workshop were as follows:

Woodwork, Junior High: Harry McGinnis, chairman; H. R. Parks, B. W. Hargis, P. J. Pallissard, Carl Rosser, and E. M. Hale.

(Continued on page 18A)

	Private	*Student*
1. Age	Sixteen with the consent of parents	Eighteen with the consent of parents
2. Character	Good moral character	Same
3. Citizenship	Citizen of U. S.	Same
4. Education	Read, speak, or understand English or the limitations are put on certificate	Read, speak, and understand English
5. Physical condition	Passed by doctor with any limitations noted	Same
6. Aeronautical knowledge	None	Written examination
7. Aeronautical experience	None	Thirty-five hours solo of which five are within sixty days of written examination
8. Aeronautical skill	None	Perform many maneuvers
9. Military competence	None	Pass CAA written examinations and applies within six months of discharge for license applicable to training

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Address.....

City.....(.....) State.....

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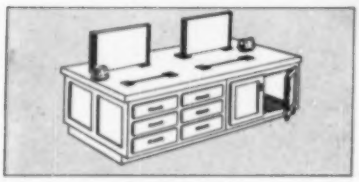
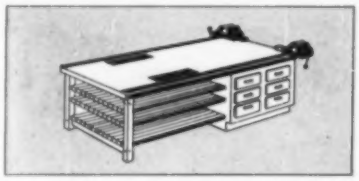
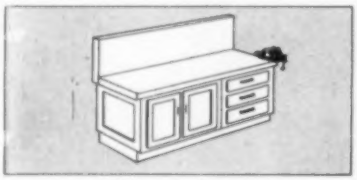


Wiring Bench



General Shop Bench



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(Continued from page 136)

Woodwork, Senior High: H. A. Allender, chairman; E. L. Southard, and Leo Paulding.

General Metal, Junior High: J. W. Bollinger, chairman, O. F. Oldham, and Earl McMahon.

Machine Shop, Senior High: H. E. Miller, chairman, D. E. Dewey.

Crafts: Ida Vernon Bates, chairman; Zelphia Layton, Alice Arnold, and Joe B. Rives.

Electricity, Senior High: C. D. Cason, chairman; and C. E. Gumm, co-chairman.

Special Problems: Claire Nowatski.

The course outlines are being typed and placed in a loose-leaf binder for use during the year. Meetings will be held from time to time to compare notes and discuss changes before the final draft is ready for duplicating. Prints will be available soon for some of the courses.

Personal News

WELL-KNOWN VOCATIONAL EDUCATOR RETIRES

Philip L. McNamee, assistant superintendent, department of vocational education, Chicago, Ill., retired on January 28, 1949.

Mr. McNamee was born in Philadelphia, Pa. Later he accompanied his family when they moved to Joliet, Ill., and then to Chicago. At this latter city he served an apprenticeship in printing and served at that trade with the John F. Higgins Printing Company, and later on the staff of the Western Newspaper Union. He also served as a newspaper reporter.

In 1917 he began his teaching activity as a substitute in the elementary schools of Chicago. After his assignment as teacher of printing to the Hibbard Elementary School, he started to print a monthly and later a weekly magazine in his school shop.

In 1924 he was transferred to the Washburne Continuation School and in 1927 he was made industrial co-ordinator. He was appointed assistant superintendent in charge of vocational education, in 1941.

Philip L. McNamee

He was instrumental in furthering practically every forward move made by the Chicago school system in the field of vocational education, and was popular with the manufacturers, employers, unions, and businessmen, to such an extent that many of them were willing to finance educational undertakings when school board finances were inadequate to permit them to be inaugurated, or to be carried on.

The 166,000 warworkers trained in the Chicago schools, and the training programs carried on in 50 Chicago industries during World War II, the organization of the school for Naval Aviation Mechanics on Chicago's Navy Pier; and the building of the new Chicago Vocational School are all due to his outstanding ability as an organizer of big undertakings.

This modest and self-effacing man who has already done so much for vocational education, has still many potentialities, and it is decidedly good news to hear that he has been appointed director of educational research for the American School at Chicago. As James McKinney, president of the American School, so well says,

"The wealth of Phil McNamee's experience will be available to the whole field of vocational education. His expert counsel will be directed without restriction to those projects he deems to be important."

All of his many friends wish Phil the best of luck for the future.

COLLEGE HEAD DIES

Karl L. Adams, president of the Northern Illinois State Teachers College, DeKalb, Ill., since 1929, died on Monday, December 6, 1948.

Mr. Adams was born September 5, 1888, in Lexington, Ohio. After finishing grade school at Lexington, he entered Ohio Military Institute, then the Grand River Institute at Austinburg, Ohio, and later the Franklin Marshall Academy, Lancaster, Pa.

He received the B.S. degree in engineering from Ohio University, Athens, Ohio. For a time after graduation from the university, Mr. Adams was an employee of the Cincinnati Traction Company,

(Continued on page 20A)

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Top of Our List

We get so excited about our new books that we often neglect to remind you of texts published back in 1948, and even before! These are our everyday best sellers! If there are any here you do not know, let us send them on approval.

MACHINE SHOP THEORY AND PRACTICE — *Wagener & Arthur.* Officially adopted for the Ford Motor Company Training Department.

SWOOPE'S LESSONS IN PRACTICAL ELECTRICITY — *Hausmann.* 18th Ed.

MATHEMATICS OF THE SHOPS — *McMackin & Shaver.* 2d Ed.

HOME CRAFTS HANDBOOK — *Haines.* Also available in 7 small books, one for each craft.

INDUSTRIAL ELECTRICITY — *Nadon & Gelmine.*

TELEVISION SIMPLIFIED — *Kiver.*

TELEVISION AND F-M RECEIVER SERVICING — *Kiver.*

ELEMENTARY RADIO SERVICING — *Wellman.*

HOME MECHANICS HANDBOOK — *Haines.* Also available in 6 small books.

Brand New for Spring

WATCH REPAIRER'S MANUAL — *Fried.*

PRIMER ON BUDGETING — *Wellington.*

FURNITURE MAKING AND CABINET WORK — *Pelton.*

Want our new Vocational Catalog?

Van Nostrand

250 FOURTH AVENUE, NEW YORK 3

(Continued from page 18A)

then became instructor of science and athletic coach at the high school at Sidney, Ohio. Later he took a position at Moline, Ill., in the high school, being shortly promoted to assistant principal there.

In 1916, he took a position in the science division at the state teachers college, St. Cloud, Minn. After serving here for 13 years, during which he became assistant to the president, he entered Columbia University, where he earned his master's degree, and then accepted the position of president at the teachers college at DeKalb where he has remained until his death.

He is survived by his widow and two children.

RALPH T. CRAIGO RETIRES

Ralph T. Craigo, assistant director of William Hood Dunwoody Industrial Institute, Minneapolis, Minn., for over thirty years, retired from active service October 1, 1948.

Mr. Craigo is a native of Wisconsin, and a graduate in engineering from the University of Wisconsin. Before entering the field of education, he was employed by the American Light and Traction Company of New York. Then he joined the faculty of the University of Wisconsin extension division, where he taught mathematics and engineering subjects. He also worked in the training programs of large industrial plants in Milwaukee, such as Allis-Chalmers, Vilter Mfg. Co., and others.

Ralph T. Craigo

When he left the University of Wisconsin, he took a position with a refrigeration equipment firm. This took him to Minneapolis where he heard of the founding of the Dunwoody Institute. Since then he has served that institution as assistant director, and can justly claim credit for a good part of the success of that well-known school.

Concurrently with his duties at Dunwoody Institute, he served for 14 years as special instructor in the industrial education department of the University of Minnesota; and for seven summer sessions at Fort Collins in the Colorado A. & M. College.

With his wide experience in business, industry, engineering, and industrial education, he is in a fine position to help the growth of industrial education in many ways as organizer, consultant, adviser, and as vocational guidance counselor. He should also ease up on his strenuous pace and enjoy some of the leisure which he has earned. Our best wishes go out to Mr. Craigo.

♦ DR. ENRICO VOLTERRA of Rome, Italy, has been appointed associate professor of mechanics at Illinois Institute of Technology, effective February 1, 1949, as announced by Dr. LeVan Griffis, head of the department.

A native of Italy, Dr. Volterra obtained the degree of civil engineer in 1928 at Rome University. Later he did design work in reinforced concrete structures.

From 1934 to 1938 he taught mechanics and structures at Rome University. In 1939 he went to Cambridge University and did research work on structural problems and materials testing at the engineering laboratory. He was awarded a Ph.D. degree by Cambridge.

He is the author of numerous technical papers in Italian, German, and British journals.

♦ New appointments in the School of Education, University of Pennsylvania include DR. WILLIAM B. CASTETTER, formerly on the faculty of Lebanon Valley College, Pennsylvania; DR. LEE O. GARBER, who was recently Specialist in Education for the Tennessee Valley Authority and who has served in the Education Departments at Butler University, Lake Forest College, and State Teachers College, Mankato, Minn.; DR. ALBERT I. OLIVER, from the University of Colorado; DR. HUGH M. SHAFER, formerly head of the Department of Education of Morehead State College in Kentucky, and on the faculty of the University of Minnesota and the University of Oregon.

♦ HUGH P. FELL, vice-president in charge of production, Borden's Chemical Division, will retire March 31, after 29 years of service, it has been announced by W. F. Leicester, vice-president of the Borden Company, 350 Madison Ave., New York 17, N. Y.

ERNEST E. NOVOTNY, divisional vice-president, has been named to succeed Mr. Fell. NILS ANDERSON, JR., also divisional vice-president, has been appointed vice-president in charge of sales.

♦ C. E. HIGHLEN, former exhibits manager and president of the Michigan Industrial Education Society 1940–41, is now a member of the faculty of the division of applied psychology and education at Purdue University. Following service in the navy, he accepted a position as assistant to Dr. L. H. Dennis, executive secretary-treasurer of the American Vocational Association, in Washington, D. C. Before going to Purdue University, he was principal of the Technical High School in Atlantic City, N. J.

♦ LINDSAY G. FARNAN of Rochester, N. Y., has been appointed to the position of assistant professor of industrial-arts education at Western Michigan College, Kalamazoo, Mich. He takes the place of the retired Marion J. Sherwood, former head of the department.

Mr. Farnan has his bachelor of science degree from the Buffalo State Teachers College, and his master of arts degree from the Iowa State College. He served during the past year as instructor in the industrial-education department of Iowa State College.

♦ The following named graduates of The Stout Institute's January class have accepted teaching positions.

HOWARD ROEN has been appointed chairman of the industrial-education department in the public schools of Freeport, Ill.

MELVIN LEMON is organizing a new general shop program for the public schools of Plano, Ill.

DAVID DAILEY has accepted a job with the public school system of Van Dyke, Mich.

JACK BONGEY, VICTOR HENDRIES, DON NANTZ, GORDON NEISNER, MELVIN OLSON, CLYDE SCHWELLENBACH, THEODORE TESCHKE, BRUCE THOMPSON, LOWELL TUFT, ROGER WINDBERG, and GEORGE ZIMMERMAN have enrolled in The Stout graduate school to work toward a master's degree.

♦ WALTER CAMERON KLINGENSMITH, a teacher of the Somers Trade School, Pittsburgh, Pa., passed away recently.

He taught in the Pittsburgh public schools for 20 years, and was a lifelong resident of Pittsburgh. He was born here August 8, 1888. In 1914 he was graduated from Pennsylvania State College, School of Agricultural Chemistry.

Mr. Klingensmith was formerly associated with the Bell Telephone Company of Pennsylvania. He was a past president of Trade and Industrial Education Association, and more recently a board member of this organization.

(Continued on page 22A)

CLASSWORK — Today

PROFESSION — Tomorrow

When his instructor's guidance is gone— will he have all he needs to carry on alone?

The competition of the professional world leaves no room for "second-best." To the student, the finest possible tools within his means are important to proper learning.

POST draftsmen's instruments are designed by master craftsmen to give the user the top quality performance he **must** have (whatever step of the "career ladder" he may be on).

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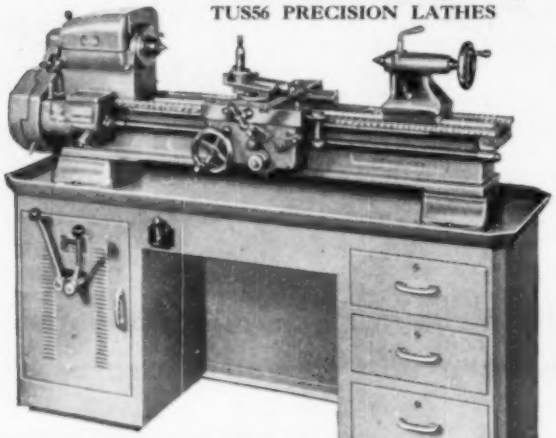
SHELDON

TUS56 PRECISION LATHES



TEACH THE GREATEST NUMBER

of operations . . . at least expense . . . with greatest safety!

● The Sheldon TUS56 Precision Lathe is not only the finest school lathe, it is also the most practical. Its large capacity, full size standard controls permit the teaching of all lathe operations at standard industrial speeds and feeds. Its "Zero Precision" (Timken finest) Taper Roller Spindle Bearing permit working to the very closest tool room tolerances and hold their extreme accuracy without servicing even under years of student operation. Its safer because all belts, motor and drive are completely enclosed — speed changes are made entirely with external levers.

WRITE FOR NEW G-48 CATALOG

No. 3007 MILLING MACHINE

No. 8000 12" SHAPER

L-44

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4244 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

(Continued from page 20A)

♦ The following recent graduates of the California State Teachers College, California, Pa., are now located in teaching positions as follows:

Robert T. Adams, High School, Ford City, Pa.; Joseph T. Aglio, High School, California, Pa.; William C. Bohn, Terrace School for Craftsman, New Castle, Pa.; Walter A. Bowman, State Teachers College, California, Pa.; James D. Brammer, High School, Taneytown, Md.; Adam Budnick, Allegany High School, Cumberland, Md.; Vaughn M. Campbell, High School, Oil City, Pa.; Carl R. Fallier, Adams Twp., Sidman, Pa.; Aladin B. Ferian, High School, Latrobe, Pa.; Benjamin W. Fresch, High School, Wesleyville, Pa.; John M. Gallik, High School, Dundalk, Balt. Co., Md.; Alexander Ganyu, High School, Barton, Md.; Theodore Gladys, High School, Braddock, Pa.; and Harry W. Hardy, 2nd, High School, Ingram, Pa.

♦ W. R. Baker, head of the graphic arts department, The Stout Institute, Menomonie, Wis., has been appointed chairman of the professional problems committee of the National Association for Printing Education, Inc., with headquarters in Washington, D. C. Reports of this committee are usually published in book form for distribution to members of the association.

♦ Bill Simmons succeeds Walter Massey as second shift trade welding instructor at Kansas State Teachers College, Pittsburg, Kans. He is a graduate of the Kansas State Teachers College trade welding program.

♦ J. E. DeSpain is teaching industrial arts and trade printing at Altamont, Kans., succeeding Frank Borgna. Mr. DeSpain secured his experience in printing as an employee of the Altamont Journal, Galena Times, and a Columbus printing concern.

♦ Hugh F. Pierce, a former member of the staff of the Michigan state department of vocational education, and more recently on the faculty of Colorado State College, has been appointed lectu in vocational education at the University of Michigan, Ann Arbor, Mich.

♦ Howard P. Skinner, formerly vocational coordinator at Marquette, Mich., has been appointed assistant director of vocational education at Muskegon, Mich.

Mr. Skinner has been chosen by the Michigan Industrial Education Society, to be the chairman of the master teacher award. He takes the place of Harold Van Westrienen who resigned after serving as chairman of this committee for two years.

♦ John A. Backus received a memorial medal at the graduation exercise of the New York School of Printing, last June. Mr. Backus has richly deserved this honor, because as an educator and as a representative of industry he has always worked hard to assist in advancing the cause of printing education.

♦ William E. Caswell, a member of the faculty of the industrial-arts department of Millersville State Teachers College, Millersville, Pa., died of acute cardiac dilatation very suddenly at his home on Monday, January 17.

Mr. Caswell had joined the faculty of the Millersville State Teachers College in September, 1948, and was engaged in the supervision of practice teaching off the campus.

Mr. Caswell received his bachelor's degree at Mansfield State Teachers College, his master's degree at Ohio State University, and was working toward the doctorate at Pennsylvania State College. He had taught in the laboratory school at Mansfield and at the McDonogh school, McDonogh, Md. He was a member of Phi Delta Kappa, Iota Lambda Sigma, and Epsilon Pi Tau.

♦ Lloyd Whydotski, present chairman of the printing department at Wausau Vocational school, Wausau, Wis., has been appointed assistant professor in the teaching of printing at The Stout Institute. He replaces Darvey E. Carlsen, teacher of printing at Stout since 1942, who has accepted the chairmanship of the printing department at the University of California, Santa Barbara branch.

Mr. Whydotski, a graduate of Stout and Colorado College of Education, will begin his duties at Stout at the beginning of the second semester.

♦ Lyle G. Wines was recently appointed supervisor of vocational instruction at the California Institution for Men at Chino, Calif.

Mr. Wines received his B.S. degree from The Stout Institute in 1933, and his M.S. degree from The Stout Institute in 1941. He has done some additional work at Utah State Agricultural College and University of California at Los Angeles.

His teaching experience includes two years rural work, two years in Flint, Mich., nine years in Dearborn, Mich., one year at Utah State Agricultural College as head of the department of aeronautics, and one year with the Long Beach City College, California. Appointed to his present position in the California State Department of Corrections is a result of state-wide Civil Service examinations and became effective July 19, 1948.

♦ Merrill Campbell, graduate of California State Teachers College, California, Pa., has been appointed instructor of electricity at his Alma Mater. He received his M.A. degree from the University of Pittsburgh, and has also taken some work at Geneva College and the University of Paris for a summer session.

Mr. Campbell taught in the public schools of Dale Borough, Johnstown, Pa., Midland, Pa., and Barton, Md.

♦ Irvin J. Shutsy has been appointed instructor of advanced woodwork, architectural drawing and design, curriculum building, and supervisor of student teachers at California State Teachers College, California, Pa. He is a member of Pi Sigma Pi, Epsilon Pi Tau, and is active in Boy Scout activities.

♦ G. Elwood Hookey has been appointed field

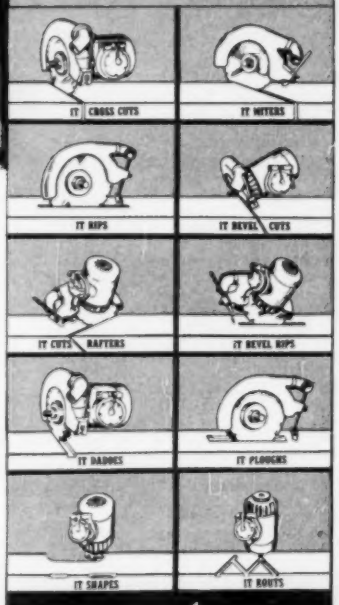
(Continued on page 30A)

Make this a required course . . . and your wood-shop training is complete!

Wood Shop Machine Course No. 1

HOW TO OPERATE A DE WALT

DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

After the student has completed his basic training course in the use of hand tools, he should have a required course in the operation of DeWalt.

Knowing how to make the fullest use of this flexible, easy-to-operate machine, will give any student a head-start as he prepares for tomorrow's industry.

When he leaves school he will be fully acquainted with a machine that is destined to occupy a prominent place in tomorrow's industry. The perfection of the DeWalt saw has created new methods in cutting wood, making obsolete old-style equipment previously used.

Ask a nearby DeWalt dealer about two DeWalt 16MM movies—one showing the general application of DeWalt—the other showing modern, pre-cutting techniques developed during the war. Write for catalog.

DE WALT, INC.

73 Fountain Avenue Lancaster, Penna.

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
- a) Coke
- b) Foundry
- c) Scrap

BELT LACER
BENCHES
- a) Coremaking
- b) For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
- c) Molding

BLACKBOARD — permanent or portable
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BULLETIN BOARD
CABINETS — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — teacher's, and tablet arm if needed for related-subjects room, or for demonstration section
CHUCK
- a) Drill, selected sizes
- b) Lathe, combination, 4 jaw, selected sizes
- c) Lathe, independent, 4 jaw, selected sizes
- d) Lathe, universal 3 jaw, selected sizes
- e) Milling machine, universal

CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand, of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
- a) Bench, hand
- b) Breast
- c) Electric, portable
- d) Hand
- e) Post, hand or power
- f) Radial
- g) Sensitive
- h) Upright, power

FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
- a) Annealing
- b) Bench
- c) Brass and soft metal
- d) Combination bench
- e) Casehardening
- f) Cyanide
- g) Gasoline
- h) Heat-treating
- i) Melting

GEAR-CUTTING MACHINE
GRINDER
- a) Bench, hand or power driven
- b) Combination grinder, buffer, and polisher
- c) Emery, bench or pedestal type
- d) Face, with magnetic chuck
- e) Portable tool post
- f) Precision, for external and internal grinding
- g) Universal tool cutter, drill and reamer grinder
- h) Wet tool

HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola, 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
- a) Automatic
- b) Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
- c) Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
- d) Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
- e) Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
- f) Turret
- g) Metal spinning

MILLING MACHINE
- a) Plain, cone or motor-driven type
- b) Universal, cone or motor-driven type

NIBBLING MACHINE
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
- a) Counter for machine shop
- b) Platform, for foundry, 1000-lb. capacity

SHAPER
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
- a) Blacksmith
- b) Drill press
- c) Machinist
- d) Pipe
- e) Planer
- f) Shaper

WELDING OUTFIT
- a) Acetylene
- b) Electric

Metalworking—Small Tools

ARBORS
- a) Drill chuck to suit requirements
- b) Reamers, various sizes
- c) Shell tool, various sizes
- d) Straight shank for shell reamers and shell drills, selected sizes
- e) Taper shank for shell reamers and shell drills, selected sizes

BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
- a) Bench
- b) Core box
- c) Core painting
- d) Hard brushes for foundry
- e) Floor
- f) Soft brushes for foundry

BULB SPONGES — for molders
DRAW PINS — for molders
CALIPERS
- a) Hermaphrodite, 4 in. and 6 in.
- b) Inside, 4 in. and 6 in.
- c) Outside, 4 in. and 6 in.

CANS
- a) Oil, 1/3 pt., 1 pt., and 10 gal.
- b) Waste

CENTER TESTERS
CHISELS
- a) Cape, 3/8 in. and 5/8 in.
- b) Cold, 3/8 in. and 3/4 in.
- c) Diamond point, 3/8 in. and 1/2 in.
- d) Roundnose, 3/8 in. and 1/2 in.

CLAMPS
- a) 4 in., 6 in., 8 in., and 10 in.
- b) Flask, for foundry
- c) Strap, various sizes

CAKE FORKS — for foundry
COLLETS
- a) For milling machine, selected sizes
- b) For lathe, selected sizes

COMBINATION SQUARES—with hardened head and blade, and protractor head, 9 in. and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
- a) Shanks, single end to fit ladles
- b) Shanks, hand, to fit ladle bowls

CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal slitting

DIVIDERS — Spring, 4 in. and 6 in.
DRILLS
- a) Drifts, different sizes
- b) Sleeves, different sizes
- c) Stand for Nos. 1 to 60
- d) Stand for 1/16 in. to 1/2 in. by 64ths

DRILLS
- a) Center
- b) High speed, taper shank, various sizes
- c) Jobbers, straight shank, 1/16 in. to 1/2 in. by 64ths
- d) Ratchet
- e) Straight shank, Nos. 1 to 60
- f) Taper shank, 1/2 in. to 1 in. by 16ths

FILE CARDS
FILES
- a) Die sinkers, various shapes
- b) Flat bastard, 8 in., 10 in., 12 in., and 14 in.
- c) Half round, double cut, 6 in., 8 in., 10 in., and 12 in.
- d) Hand, smooth, 8 in., 10 in., and 12 in.
- e) Mill, smooth, 8 in., 10 in., and 12 in.
- f) Round bastard, 8 in., and 10 in.
- g) Square bastard, 8 in., and 10 in.
- h) Swiss, various shapes
- j) Three-square, double cut, 6 in.
- k) Warding, double cut, 6 in.

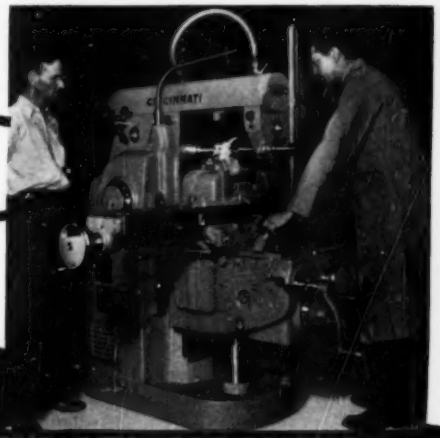
FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple, for foundry
GAUGES
- a) Center
- b) Depth
- c) Drill and wire
- d) Screw pitch, select kinds
- e) Surface
- f) Thickness

GLOVES — asbestos, for foundry
GOGGLES
- a) For machine shop
- b) For foundry

HACK SAW
- a) Blades, hand, 18T, 10 in.

(Continued on page 26A)

GIVE YOUR BOYS the advantage of these



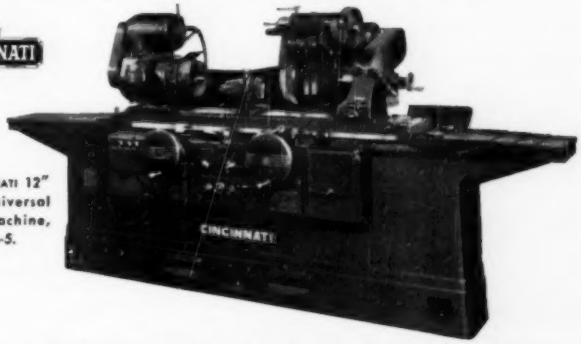
CINCINNATI MACHINES

Above: CINCINNATI No. 2ML Universal Milling Machine, catalog M-1662.

CINCINNATI 8" x 18" Tool and Die Milling Machine, catalog M-1620.

Training your boys on machines built for industry gives them the confidence they will need when they're "on their own." Several CINCINNATI machines that will be seen by your graduates wherever they go are suitable for vocational schools. Four of them are shown here. 1. CINCINNATI No. 2ML Milling Machine . . . for a variety of milling work, from cutting helical gear teeth to boring holes with fly cutters. 2. CINCINNATI No. 2 Cutter and Tool Grinder . . . for sharpening most of the cutters used in the average shop; milling cutters, planer tools, reamers, taps, etc. 3. CINCINNATI 8" x 18" Tool and Die Milling Machine . . . for making small dies and molds; for a variety of light milling operations. 4. CINCINNATI 12" Hydraulic Universal Grinding Machine . . . for all the variations of external grinding (straight cylindrical, taper, bevel, face), and for internal grinding. All these machines are safe and ruggedly built to withstand uncertain handling by students. You may obtain complete information by writing for the literature specified under the illustrations.

CINCINNATI No. 2 Cutter and Tool Grinder, catalog M-1618-1.



Right: CINCINNATI 12" Hydraulic Universal Grinding Machine, catalog G-486-5.

THE CINCINNATI MILLING MACHINE CO.

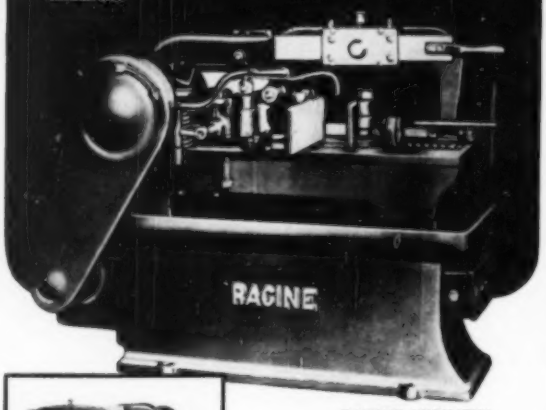
CINCINNATI GRINDERS INCORPORATED

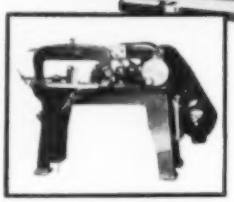
CINCINNATI 9, OHIO, U. S. A.

A RACINE "UTILITY"

MAKES METAL CUTTING SIMPLE and EASY

A 15 year old student can learn to efficiently operate a Racine "Utility" in less than 30 minutes.





RACINE "UTILITY"
Wet Cut Model

RACINE "UTILITY"
Dry Cut Model

Racine "Utilities" are used in today's large and small industries as an auxiliary saw for all-around metal cutting work. They are the ideal saws for training students between school and job.

Capacity 6" x 6", these saws will accurately cut any metal from soft aluminum tubing to hard alloy steels. Both the pressure and feed of the saw blade are controlled hydraulically. All moving parts are guarded to prevent accidents — most important in school training equipment.

"Utility" Wet Cut Model is provided with a base containing reservoir for coolant. "Utility" Dry Cut Model is the same as "wet cut" model in every detail except base consists of four sturdy iron legs.

Larger Racine Hydraulic Metal Cutting Saws in capacities of 6" x 6" to 20" x 20" are also available. WRITE for complete metal saw line catalog No. 70-C. Address RACINE TOOL & MACHINE CO., 1780 State St., Racine, Wisconsin.

RACINE
STANDARD FOR QUALITY AND PRECISION
RACINE TOOL and MACHINE CO.

RACINE
TOOL & MACHINE CO.
RACINE, WISCONSIN

STANDARD FOR QUALITY AND PRECISION

(Continued from page 24A)

b) Blades, power, 14T, 12 in.
c) Frames, adjustable

HAMMERS
a) Babbitt
b) Ball peen, 13 oz., 16 oz., or 20 oz.
c) Blacksmith's, various kinds
d) Riveting, 9 oz., and 12 oz.
e) Setting

INDICATOR
a) Center
b) Universal or universal dial test
c) Speed

KNURLING TOOL — with assorted knurls

LADLES
a) Bull
b) Hand bowls
c) Melting

LATHE DOGS — ½ in., ¾ in., 1 in., 1½ in., 2 in., 2½ in., and 3 in.

LEGGINGS — fireproofed duck, to protect students when pouring in foundry

LEVEL — 6-in. bench

LIFTING SCREWS — for molders

MALLETS — wood or soft

MANDRELS — selected sizes

MICROMETERS — inside, 1½ in. to 8 in.; outside, 0 to 1 in.; outside, 1 in. to 2 in.; outside, 2 in. to 3 in.

MOLDING BOARDS

MOLDING STICKS AND TROWELS — various kinds

NIPPERS — end cutting, 5 in.

OIL STORAGE TANK — with pump

OILSTONES — medium and fine

PAILS — galvanized, 12-qt. capacity for foundry

PARALLELS
a) Adjustable
b) Steel, assorted sizes

PLIERS
a) Combination, 6 in.
b) Side-cutting, 6 in.

PUNCHES
a) Center, ¼ in. and ⅜ in.
b) Hollow, ½ in., ¾ in., and 1 in.
c) Pin, ⅛ in., 5/32 in., 3/16 in., 7/32 in., and ¼ in.
d) Prick, ¼ in.

RAMMERS — for foundry
a) Hand
b) Floor

REAMERS — various sizes
a) Adjustable
b) Hand
c) Taper pin
d) With taper shank

RIDDLES — ¼-in. and ½-in. mesh, 18-in. diameter, for foundry

RIVET SETS — assorted sizes

SCALES
a) Steel, 6 in., graduated 1/64 in. to ½ in.
b) Steel, 12 in., graduated to 32nds

SCREW DRIVERS — 6 in. and 9 in. blade

SCRIBERS

SHOVELS
a) Coke
b) Sand

SNIPS — tin, 3 in. straight and 3 in. curved

SOCKETS — for taper shanks, drill and tools, selected sizes

SOLDERING COPPERS AND HANDLES — 1-lb. size

SPRAY CAN — for molders

SPRINKLING CANS — galvanized iron, 16-qt. capacity, for foundry

SPRUE PICKS — for molders

SQUARES
a) Machinist's, 6 in.
b) Blacksmith's

STEEL FIGURES, ⅛ in.

STEEL LETTERS — ⅛ in.

SWABS — for molders

TAPELINE — steel, 25 ft.

TAPS AND DIES
a) Machine screws
b) Pipe
c) N.F. ¼ in. to ⅜ in.
d) N.C. ¼ in. to ⅜ in.

TONGS
a) Blacksmith's, various kinds
b) Pick up, for foundry
c) Shake out, for foundry

TOOL HOLDERS
a) Boring tools
b) Cutting-off tools
c) Planer
d) R.H. and L.H. offset shank
e) Shaper
f) Slotter
g) Straight shank
h) Threading

TOOL-HOLDER BITS — square, ¼ in., 5/16 in., ⅜ in., 7/16 in., ½ in.

TRAMMEL POINTS

V BLOCKS AND CLAMPS

WHEEL DRESSER

WRENCHES
a) Adjustable, 8 in. and 10 in.
b) Pipe, 8 in. and 12 in.
c) Tap, adjustable, various sizes

Metalworking—
Materials and Supplies

ABRASIVE CLOTH — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls from 1 to 28 in. wide

ABRASIVE WHEELS

ACETYLENE GAS — in drums for welding

ALUMINUM
a) Pigs for foundry
b) Sheets, tubing, rounds, shapes, wire, etc.

BABBITT METAL

BEARING BLUE

BELT DRESSING

BELT LACING MATERIAL

BELT LEATHER

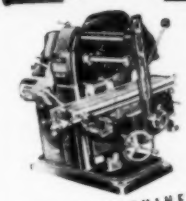
BOLTS
a) Carriage, selected sizes
b) Lag, selected sizes
c) Machine, selected sizes
d) N.F., selected sizes
e) Stove, flat or roundheads, selected sizes

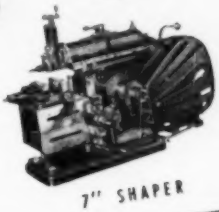
BRASS
a) Bars, 3/32 in., ⅛ in., 3/16 in., and ¼ in. thick; ⅜ in. to 1 in. wide, 8 ft. to 10 ft. long, selected sizes
b) Round rods, 3/16 in. to ½ in. by 16ths, selected sizes
c) Sheets, 28 to 32 American gauge, 12 in. wide by 72 in. to 84 in. long, selected sizes

(Continued on page 28A)

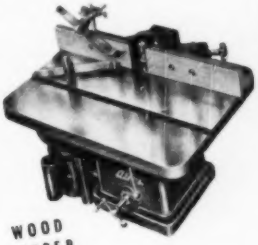
NOW An *Atlas* Tool for Practically Every Instructional Need In Your Shop

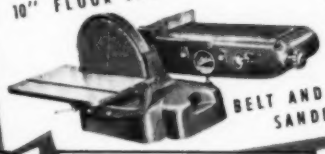
For METALWORKING





For WOODWORKING





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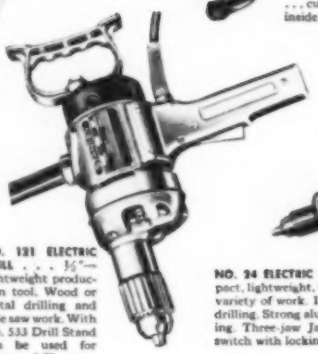

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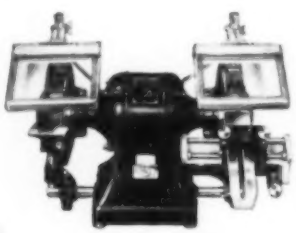

NO. 677 EDGE TOOL GRINDER . . . 7" x 1" wheels, ¼ h.p.—designed for industry and school shops. Operates at correct slow speed for edge tool grinding. One wheel for tool grinding, one for general grinding. "Fluid-Lite" Eye Shields connected into motor circuit. Patented fixture for grinding plane irons up to 2⅜" and any size chisel.

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(Continued from page 28A)

d) Strips, 1/32 in. and 1/16 in. thick, ½ in. to 1½ in. wide, 50 ft. to a coil, selected sizes
e) Threaded rods, Nos. 6 to 10, in 24 in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24 in. lengths, selected sizes
f) Wire, soft, 8, 11, and 14 American gauge, selected sizes
g) Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS

CHAPLETS — single and double head

COAL
a) Charcoal for foundry or forge
b) Coke for foundry
c) Forge

COPPER
a) Pigs, for casting alloys
b) Sheets, 8 to 25 American gauge, 30 in. by 60 in., selected sizes
c) Tubing, outside diameters, 3/16 in., ¼ in., 5/16 in., ⅜ in., ½ in.; thickness of wall, 1/32 in.; lengths, 8 ft. to 12 ft., selected sizes
d) Wire, soft, 2 to 20 American gauge, in coils. Also in ¼, ½, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

CORE
a) Compounds
b) Flour
c) Paste
d) Oil
e) Wax-vent wire

CUTTING COMPOUNDS

FIREBRICKS AND CLAY — for foundry

FIRE HANDLES — assorted sizes

GRAPHITE — for foundry

IRON — Pig, for foundry

LACQUER — transparent and colored, for finishing

NUTS — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds

OIL
a) Boiled linseed
b) Lubricating
c) Quenching and hardening

PACKING
Round, sheet, square, or tubular

PAINT — back asphaltum

PINS
a) Cotter, 3/32-in. to ¼-in. diam. from ½ in. to 2 in. long
b) Flask, for flask repairs
c) Taper, Nos. 0 to 6, ¾ in. to 2 in. long

PUMICE POWDER

RIVETS
a) Copper, with burrs, Nos. 7 to 14, lengths, ⅜ in. to ¾ in., selected sizes
b) Iron, No. 14 gauge to 3/16 in., flathead or button head, ¼ in. to 1 in. long, selected sizes
c) Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes

SAND
a) Molding, in 350-lb. barrels or 800-lb. casks
b) Parting, in 350-lb. barrels or 800-lb. casks

SCREWS
a) Flathead or roundhead iron or brass, selected sizes and kinds
b) Cap and machine, iron or brass, selected sizes and kinds
c) Set, head and headless

SOLDER — acid or rosin core; bar, or solid wire

SOLDERING PASTE OR SALTS

STEEL
a) Bessemer, rod, 1/64 in. to ⅜ in. by 64ths, in 4-ft. lengths, selected sizes
b) Bars, cold rolled, ⅛ in. to ¾ in. thick, ½ in. to 2 in. wide, 12-ft. lengths, selected sizes
c) Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes
d) Rods, hexagon and square, cold rolled, ¼ in. to ¾ in., in 12-ft. lengths, selected sizes
e) Round, cold rolled, diameters ⅛ in. to 1 in., lengths 12 ft., selected sizes
f) Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in.
g) Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28 U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in., selected sizes
h) Threaded rods, Nos. 6 to 10, in 12-in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24-in. lengths, selected sizes

TIN
a) Pigs, for casting alloys
b) 1C, 1X, 20 by 48 in.
c) 1XX, 20 by 48 in.

WASHERS AND BURRS
a) Copper, burrs, Nos. 3 to 14, in 1-lb. boxes
b) Iron burrs, Nos. 3 to 14, in 1-lb. boxes
c) Brass washers, 3/16 in. to ½ in. by 16ths
d) Iron washers, 3/16 in. to ½ in. by 16ths

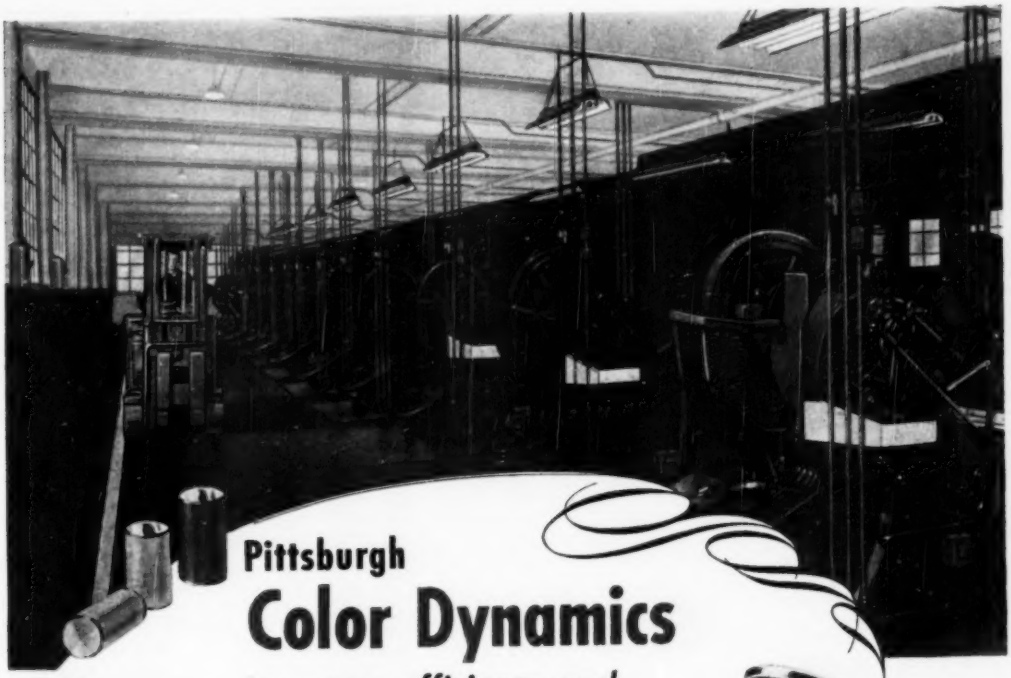
WELDING FLUXES

WELDING RODS (all rods come in 24-in. lengths)
a) Brazing, 1/16-in., ⅛-in., and 3/16-in. diameter
b) Cast aluminum, 3/16-in., ¼-in., and ⅜-in. diameter
c) Cast brass, 3/16-in., and ⅛-in. diameter
d) Cast bronze, ⅛-in. diameter
e) Cast copper, 3/16-in. and ¼-in. diameter
f) Cast iron, 3/16-in., ¼-in., 5/16-in., and ⅜-in. diameter
g) Low carbon steel, ⅛-in., ¼-in., and ¼-in. diameter

WHITE LEAD — for machine shop

WIRE
a) Annealed, 16 to 34 W and M gauge, selected sizes
b) Coppered market, 5 to 18 W and M gauge, selected sizes
c) Coppered spring, 2 to 18 W and M gauge, selected sizes
d) Galvanized, 5 to 18 W and M gauge, selected sizes
e) Piano, Nos. 2/0 to 36, selected sizes
f) Tinned, 16 to 24 W and M gauge, selected sizes
g) Wool, Nos. 0 to 3 in 1-lb packages, selected sizes

ZINC
a) Pigs, for casting alloys
b) Sheet, Nos. 4 to 14, sheets 36 in. by 84 in.



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Teach your students how the scientific use of energy in colors makes production safer and better

BESIDES a knowledge of metals, machines and methods, the skilled shopman of tomorrow must know how to use color to turn out more and better production.

By using Pittsburgh's system of COLOR DYNAMICS he will be able to focus an operator's attention more closely on his task.

Use of proper *focal* colors will separate working parts from stationary parts of the machine and from the material being worked on. This reduces eye travel, which is one of the chief causes of eye fatigue. The result of this improved visibility makes itself felt in the daily output of the worker—and in his attitude toward his work.

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(Continued from page 22A)

instructor in distributive education at Indiana University. A former director of distributive education in the Terre Haute, Ind., city schools, Mr. Hookey received his bachelor's degree from Indiana State Teachers College, Terre Haute, Ind., and his master's degree from Oklahoma A. & M. College, Stillwater, Okla., where he served as graduate assistant in the School of Vocational Business, and was named to membership in the Delta Pi Epsilon honorary business fraternity.

Mr. Hookey taught business subjects in the public schools of Rockville, Plymouth, Brazil, and Terre Haute, Ind., in addition to considerable practical experience in private business. He served in the U. S. Navy during the war as senior instructor in the U. S. Naval Training School at Northwestern University, Evanston, Ill.

♦ W. ROGER ZINN, formerly educational consultant for the Jam Handy Organization, is now assistant professor in the division of adult education, school of education, Indiana University. He also serves on the staff of the University Audio-Visual Center.

♦ J. R. MCELHENY, formerly of East Chicago, Ind., has been appointed assistant professor of industrial education, and head of the industrial-education department of the University of Miami at Coral Gables, Fla. Mr. McElheny assumed his new duties on February 1, 1949.

♦ JOHN WHITE, principal of the Garfield Intermediate School, Detroit, Mich., died recently. He was born in Osage, Iowa, and was a graduate of The Stout Institute. He also attended the University of Detroit Graduate School.

Mr. White was appointed by the Detroit public schools as a teacher at the Condon Intermediate School in 1919. In 1926 he was named a department head and acting assistant principal in 1927. He was assigned the principalship of the Garfield Intermediate School in 1942.

♦ MARJORIE A. C. YOUNG, M.P.H., M.ED., of Dorchester, Mass., has been appointed consultant in education for the National Society for the Prevention of Blindness.

Miss Young comes to her position from Springfield College, Springfield, Mass., where she was associate professor of health education for the past two years. She has also had teaching experience in Boston and Swampscott public schools and Colby Junior College in New Hampshire.

♦ S. E. ALKIRE has been appointed director of audio-visual education in the department of public instruction, Springfield, Ill.

♦ VAUGHN BAILEY, teacher of industrial arts at Fort Wayne, Ind., has been made principal of one of the grade schools in that city.

♦ ESTAL SMUTS, formerly instructor of general metalwork at the South Side High School, Fort Wayne, Ind., has been made junior co-ordinator in the field of trades and industries of that city. He will work with high school boys in guidance and placement.

♦ LEROY HOOD, principal, Ottawa High School, Ottawa, Kans., has been appointed by Supt. Henry Parker as local director of the evening school program. Plans are being made to conduct an evening course in principles of electricity for apprentice and journeyman linemen of the local power company.

♦ GEORGE W. WALLING has been appointed machine-shop instructor at Argentine High School, Kansas City, Kans.

♦ WALTER A. SIMPSON has reorganized the machine-shop program at Highland Park High School, Topeka, Kans., which was discontinued two years ago.

♦ W. L. BYRAM received his master's degree in industrial education from the University of Missouri in August, 1948, and has returned to his position as teacher of industrial arts in the public schools of Joplin, Mo.

♦ GLEN W. WHITNEY, co-ordinator at Lexington, Mo., received his master's degree in industrial education from the University of Missouri in August, and is back at his regular job.

♦ WALTER J. ROBINSON, chairman of the department of industrial arts, Northwest Louisiana State College, Natchitoches, La., is on leave for a year while he is doing graduate work toward his doctor's degree in industrial education at the University of Missouri.

♦ WALTER C. BROWN, state supervisor of industrial education in Missouri, was visiting instructor of industrial education at the University of Missouri during the 1948 summer session. Mr. Brown was especially interested in the training of twenty-odd new co-ordinators.

♦ NORBERT KOCH of the University of Chattanooga, Chattanooga, Tenn., was a graduate student in the department of industrial education of the University of Missouri during the 1948 summer session.

♦ VICTOR HAUCK received his master's degree in industrial education from the University of Missouri in August and is back on his regular job as teacher of industrial arts, Overland, Mo.

♦ EARL BROWN, instructor of electricity in the Lead Belt Trade School, Bonne Terre, Mo., received his master's degree from the University of Missouri in the 1948 summer session and is now busy enlarging his program of electrical trades in Missouri's largest area trade school.

♦ EMIL ROHLFS, co-ordinator at Normandy, Mo., received his master's degree from the University of Missouri during the past summer session.

♦ OWEN HARLAN, assistant professor of industrial education at State Teachers College, Buffalo, N. Y., conducted a graduate workshop in industrial education during the past summer school session.

This workshop was the first of its kind held at the college. Eighteen industrial-arts teachers attended.

Association News

A.V.A. CONVENTION AT MILWAUKEE

(*Continued from page 18A of the February, 1949, issue*)

The industrial arts session on Wednesday morning, December 1, 1948, was specially dedicated to industrial-arts teacher training.

Chairman at this session was Thomas Hippaka, Iowa State College, Ames, Iowa.

The speakers, Lynne C. Monroe, Santa Barbara College, Santa Barbara, Calif.; Cecil R. Hutchcroft, State Teachers College, Oswego, N. Y.; and G. Harold Silvius, Wayne University, Detroit, Mich., presented excellent discussions on keeping teacher education abreast of present-day trends, the value of cadet training, and evaluation of teacher education programs.

K. F. Perry, State Teachers College, Greeley, Colo., was the discussion leader.

The Industrial Arts Curriculum was the subject of discussion at the Wednesday afternoon session, and Gordon O. Wilbur, State Teachers College, Oswego, N. Y., acted as chairman.

The improvement of the curriculum, and the criteria for selecting subject matter were discussed by V. L. Pickens, Kansas City, Mo., and Roy A. Radtke, Milwaukee, Wis.

R. Lee Hornbake, University of Maryland, College Park, Md., gave an address on "The Price of Tradition."

Wesley Ketcham, State supervisor of industrial arts, Hartford, Conn., led the discussion.

Safety was the theme chosen for the Friday morning session.

Louis V. Newkirk, Chicago, Ill., acted as chairman.

Addresses on "Causes and Prevention of Shop Accidents," "A National Program for Shop Safety," and "The Functional Use of Color in the School Shop," were given by Raymond Stombaugh, Illinois State Normal University, Normal, Ill.; DeWitt Hunt, Oklahoma A. & M. College, Stillwater, Okla.; and K. R. Beckman, Pittsburgh Plate Glass Company, Pittsburgh, Pa.

The Friday afternoon session was devoted to an industrial-arts business meeting and to the report of the Policies and Planning Committee.

The shop demonstrations on Saturday morning were outstanding. Clyde A. Bowman, The Stout Institute, Menomonie, Wis., acted as chairman.

Ray F. Kranzusch, The Stout Institute, Menomonie, Wis.; William R. Baker, The Stout Institute, Menomonie, Wis.; O. A. Radtke, Peckham Junior High School, Milwaukee, Wis.; and Alex Bick, Hartford Elementary School, Milwaukee, Wis., assisted by some of their students, demonstrated the work done in their classes in leather craft, graphic arts, Keene cement, and aluminum.

Industrial Education Division

The Tuesday afternoon session was devoted to a discussion of supervisory training in its relation to national security.

C. L. Wetzel, vocational teacher trainer, Hadley Technical High School, St. Louis, Mo., was chairman.

The addresses touched upon program co-ordination, analyzing and determining training needs, the training of supervisory personnel, a state program of supervisory training, and the upgrading of supervision.

The speakers were Lee W. Ralston, Los Angeles, Calif.; Russell L. Packard, Packard Motor Company, Detroit, Mich.; Arthur B. Wrigley, Trenton, N. J.; Earl S. Baird, Iowa State College, Ames, Iowa; H. A. Widdowson, University of Minnesota; and D. L. Belcher, Texas A. & M. College, College Station, Tex.

Lee W. Ralston led the discussion.

Technical education and the present-day needs for this type of work also was discussed Tuesday

(Continued on page 33A)

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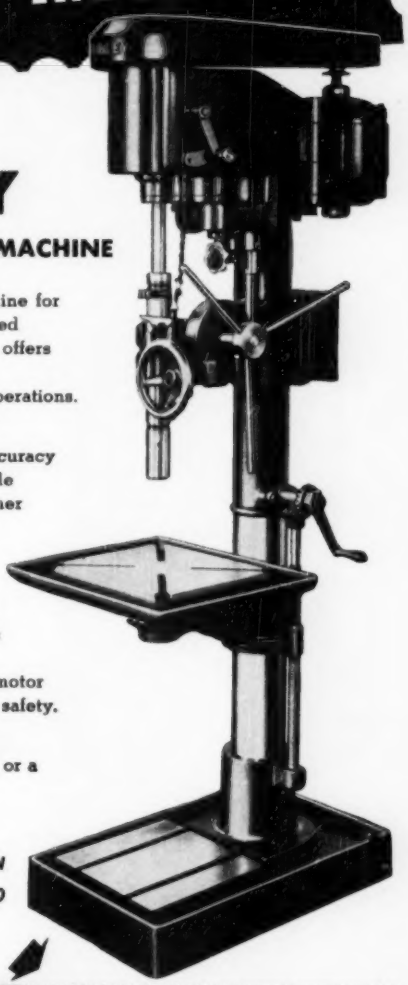

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(Continued from page 31A)

afternoon at a separate section meeting under the auspices of the American Association of Technical High Schools and Institutes.

At the general industrial-education session on Wednesday morning the question of implications and requirements of "further development" with reference to the George-Barden Act was discussed.

Russell K. Britton, Denver, Colo., was chairman of this session.

Walter H. Cooper, U. S. Office of Education, Washington, D. C., spoke on this subject on the national level; C. L. Greiber, Madison, Wis., on the state level; and Green B. Trimble, Fort Worth, Texas, on the local level.

Terminal technical education was the subject for consideration at the Wednesday afternoon meeting.

Walter J. E. Schiebel, Dallas, Tex., was the chairman, and the speakers were W. E. Stirton, Detroit, Mich.; G. H. Parkes, Williamsport, Pa.; L. L. Jarvie, Albany, N. Y.; R. W. Howes, Hartford, Conn., and L. A. Emerson, Ithaca, N. Y.

Thursday afternoon there were sectional meetings on safety in industrial education, part-time industrial education, building trades, and graphic arts.

At the building trades session Claude Ewing, director of vocational school, Chicago, Ill., was chairman.

Walter E. Durbahn, Highland Park, Ill., spoke on the building trades program for high school youth; and Kenneth L. Haas, Loyola University, Chicago, Ill., spoke on originating visual aids.

(*To be continued*)

♦ The new officers of the Pennsylvania Vocational Association are as follows: past president, Dr. Joseph W. Fleming, Pittsburgh; president, Howard E. Newcomer, Scranton; Secretary-treasurer, Henry S. Brunner, State College; editor, E. V. Moriarity, Harrisburg.

♦ Platteville Teachers College of Platteville, Wis., was host on December 11, 1948, to the Southwestern Wisconsin Vocational Guidance Conference. This was an all-day program designed to help high school youth with their plans for a life career.

Melvin H. Nass, senior student in the industrial-arts division, was director of the conference, and Alvin DuCharme and Robert Reynolds of the industrial-arts division, were his able assistants. Members of the state department of education, representatives of occupations and professions from Platteville, and members of the college staff participated.

H. A. Pederson, director of the industrial-arts division, and C. S. Johnson, metals instructor, gave guidance in the building and machine trades respectively.

About 250 high school students attended.

♦ The Long Island Vocational and Industrial Arts Association is planning to stage an exposition at the High School, Sewanhaka, Floral Park, N. Y., on March 29, 1949.

It is hoped that this exhibit will demonstrate to the general public, industrial and commercial employers, and civic-minded organizations, that industrial, vocational, and technical training in public schools is up to date in methods and equipment, and that graduates are prepared for employment in the fields they are trained for.

The exposition theme is "Education Meets Long Island's Growing Industries."

More than 25,000 men and women were trained in these schools and secured wartime employment. High school boys were given preinduction courses that would qualify them for technical duties in the armed forces.

Today these same school shops are now better manned and equipped to train high school boys to meet the higher standards of skills and trade knowledges demanded by industrial employers, and to provide better technical training for pre-engineering college and technical school students. Proof of the pudding will be shown in the school exhibits.

Sewanhaka High School will be open to the public on the evening of Tuesday, March 29, for general inspection of the exhibits.

Schools planning to exhibit include Garden City, Mineola, Hempstead, Valley Stream, Lynbrook, Rockville Centre, Baldwin, Freeport, Bellmore, Farmingdale, Hicksville, Westbury, Glen Cove, Roslyn, Port Washington, Manhasset, Great Neck, Oyster Bay, Locust Valley, Lawrence, Long Beach, Woodmere, Oceanside, Huntington, and many others.

For further information on industrial exhibits, address George Allen of the Sewanhaka High School, Floral Park, N. Y.

♦ On Friday, January 14, 1949, at 8:00 p.m., the New York Society for the Experimental Study of Education held a meeting at the Washington Irving High School, New York City.

Seymour Rothschild, principal, Junior High School 126, Queens, was the chairman. Topics discussed were:

1. How is industrial arts related to general education?
2. Should there be a general shop?
3. Can a shop be the center of pupil research?
4. How should shop classes be organized?
5. Discussion of following shops: graphic arts, electricity, textile, weaving, woodworking, metalworking, ceramics.

Robert L. Thompson, assistant professor of education, New York University, was the discussion leader, and the panel consisted of Jesse Fox, assistant superintendent, Junior High School Division, board of education; Roy G. Fales, state supervisor of industrial arts education, Albany, N. Y.; John Hurley, supervisor of industrial arts in the elementary and junior high schools, New York City; Carl Frankson, director of industrial arts education, Newark, N. J.; Wesley Ketchum, state supervisor of industrial arts edu-

(Continued on next page)

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These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSOR
- a) 3 to 4 cu. ft., with tank, piping, and motor
- b) Small portable, 1 cu. ft., with motor

ALIGNING JIG — for connecting rods

ANVIL
- a) No. 100 or No. 125
- b) Rim

ARMATURE GROWLER AND TESTER

AXLE STANDS

BATTERY EQUIPMENT
- a) Cell tester, panel type with discharge rack
- b) Charger (15-battery size) with rack
- c) Charger (6-battery size)
- d) Gas stove (small)
- e) Lead-burning torches, with gauges and piping
- f) Plate racks

BENCH
- a) Electric test, elaborate
- b) Electric test, simple
- c) Work, with vises
- d) Work, portable with vise

BLACKBOARD

BLOWTORCHES — 1-qt. size

BOOKCASE

BRAKE
- a) Adjusting stand
- b) Band-lining machine

BULLETIN BOARD

CABINETS
- a) Wood or metal, for bolts and supplies
- b) Wood or metal, for filing job sheets and correspondence

CHAIN HOIST — with overhead trolley and track

CHAIRS
- a) Teacher's
- b) For tables, or with tablet arms

CRANE — portable

CRANKSHAFT TRUING TOOL

CREEPERS

DESK — teacher's

DRILL
- a) Breast
- b) Hand
- c) Electric portable, ⅛ in.
- d) Electric portable, ¼ in.
- e) Press, 21 in., with motor and chuck

DYNAMOMETER — electric

FORGE — with blower and tools

FURNACES — gas

GREASE DISPENSERS

GRINDER
- a) Cylinder with motor
- b) 8 in., with motor
- c) 12 in., with motor

HONES — cylinder

JACKS
- a) Lever, 1½-ton
- b) Floor, roller

LATHE
- a) 11 in. by 4 ft., with motor, chucks, and attachments
- b) 16 in. by 6 ft., with motor, chucks, and attachments

PRESS
- a) Arbor
- b) 30 ton

SPRAY PAINTING OUTFIT

VALVE REFACING MACHINE

VULCANIZER
- a) Electric steam for tube work
- b) Small, hand

WELDING OUTFIT — with tanks, gauges, and cutting torch

WHEEL ALIGNMENT
- a) Gauge
- b) Test table

Automotive Shop—Small Tools

ABRASIVE — rubstone for cleaning castings in foundry

ALCOHOL TESTER

BATTERY
- a) Cell tester, prod type
- b) Cell tester, cadmium
- c) Clips, large
- d) Element pullers
- e) Fillers
- f) Funnels, glass
- g) Hydrometer, acid
- h) Knives
- i) Post builders
- j) Post drills
- k) Post markers
- m) Separator trimmer

BITS
- a) Expansive
- b) Ratchet brace
- c) Wood, 3/16 in. to 1 in.

BOLT CUTTER — 24 in. and 36 in.

CALIPERS — 6 in. inside and outside

CANS
- a) Oil, 1/3 pt.
- b) 1 gal., gas, safety
- c) 5 gal., gas, safety
- d) 5 gal., kerosine
- e) Waste

CHECKS — tool, 1000, blank

CHISELS
- a) Cape, ⅜ in. and ¾ in.
- b) Cold, ⅜ in., ½ in., ¾ in., 1 in.
- c) Diamond point

COMBINATION SQUARES — 12 in.

COTTER-PIN EXTRACTOR

DIVIDERS — 6 in. and 10 in.

DRILL SETS
- a) 1/32 in. to ½ in., by 64ths
- b) ½ in. to 1¼ in., by 32nds

FILE CARDS

FILE HANDLES — assorted

FILES
- a) Flat bastard, 6 in., 8 in., 10 in., and 12 in.
- b) Half round, 6 in., 8 in., 10 in., and 12 in.
- c) Mill, 6 in., 8 in., 10 in., and 12 in.
- d) Round, 6 in., 8 in., 10 in., and 12 in.
- e) Square, 8 in., 10 in., and 12 in.

FIRE EXTINGUISHERS — Pyrene and Acid

FIRST-AID CABINET AND SUPPLIES

FLOOR BRUSHES — 18 in.

FUNNELS — tin, assorted sizes

GAUGES
- a) Air pressure
- b) Center
- c) Depth
- d) Thread
- e) Thickness

GLASS CUTTERS

GOGGLES

GREASE GUNS — plain and pressure type

HAMMERS
- a) Ball peen, 4 oz.
- b) Ball peen, 1¼ lb.
- c) Ball peen, 2 lb.
- d) Lead
- e) Riveting
- f) Sledge, No. 12

LADLE
- a) 3-in. bowl
- b) 6-in. bowl

LAMPS — extension, with reels

LEAD POT — gas

MAGNET CHARGER

METERS — volt and ammeter test

MICROMETERS
- a) Outside, 0 to 1 in.
- b) Outside, 2 in. to 3 in.
- c) Outside, 3 in. to 4 in.
- d) Inside, 1½ in. to 6 in.

MOLDS
- a) Battery nut
- b) Battery post
- c) Battery strap
- d) Burning stick
- e) Lead hammer

OILSTONE

PIPE TAPS — ⅛ in., ¼ in., ⅜ in., and ½ in.

PLIERS
- a) Combination, 6 in.
- b) Flat nose
- c) Roundnose

PULLERS
- a) Bearing
- b) Gear
- c) Wheel, hub type

PUNCHES
- a) Center
- b) Taper pin
- c) Blacksmith

PUTTY KNIVES

(Continued on page 36A)

(Continued from previous page)

cation, Hartford, Conn.; Paul Galanka, P.S. 79, Bronx, and president of Industrial Arts Teachers' Guild, Bronx; Peter Furnari, instructor of industrial arts, Wappinger Falls High School, N. Y., and chairman of New York State Steering Committee on Industrial Arts Education; and George Metz, graduate student, New York University, School of Education.

♦ The 17th annual initiation of the Mu Sigma Pi graduate professional fraternity at Wayne University was held at the Warren Valley Gold Club, Detroit, on November 5. The following were initiated:

Two of these men were initiated as associate members: Archie Pearson, director of training at the Ford Motor Company, and Wallace Williams, director of vocational education at Hamtramck, Mich.

Honorary membership was conferred on Dr. John Lee, dean of the graduate School at Wayne University.

Norman Reckling, Harlyn Arthur, and Robert Swearingen made the arrangements for this initiation and banquet. Charles H. Sechrest was director of the initiation ritual. Gerald Baysinger, professor of industrial education at Wayne University, served as toastmaster. The address at the dinner was given by Major J. H. Peacock. He spoke on "Economic Mobilization," representing the Ordinance Department. George Donaldson, president of the Mu Sigma Pi, along with Andrew Althouse, faculty sponsor, took an active part in this program.

Seventeenth annual initiation, Mu Sigma Pi

First row, left to right: Paul Payne, Arthur Halloran, Jacob Schoeppler, Wallace Williams, Dr. John J. Lee, Archie Pearson, Nicholas Birta, James Day, William Bettencourt

Second row: Clayton Luther, William Leach, Austin Jepson, Hunter Judd, Joseph Magnatta, Wayne Felbarth, William Slaby, James Cooney, Kenneth Schuyler

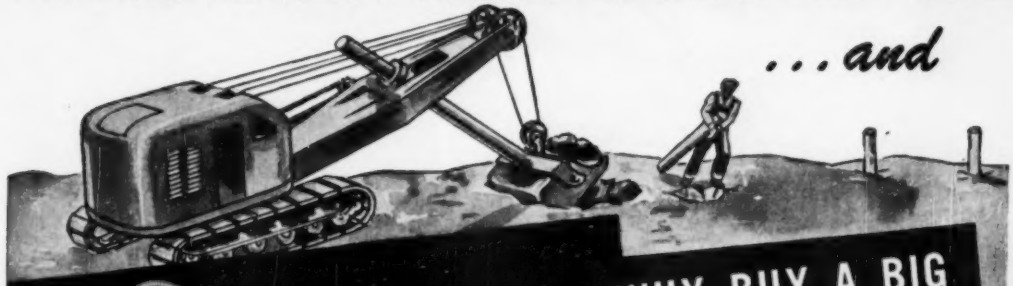
Third row: Kenneth Stoddart, William Rowe, James Hasenau, Harold Hill, Emil Traum, John Prepolec, Thomas Harrison, William Spence, and James Christopherson

♦ The Allegheny County Industrial Arts Teachers Association held their monthly meeting at Homeville Jr. High School in West Mifflin County, Pa. Sixty industrial-arts instructors from Western Pennsylvania were present.

President Phillip Young opened the meeting by introducing Dr. Bruce, superintendent of schools. He talked on the philosophy of shop planning and the things that should be in a shop to make it comfortable and pleasant to work in.

(Continued on page 47A)

WHY USE A POWER SHOVEL TO DIG A POST HOLE



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Snap-on Tools
THE CHOICE OF BETTER MECHANICS

(Continued from page 34A)

REAMER — spindle bolt
REAMER SETS
- *a*) Piston pin, ⅛ in. to 1 13/16 in.
- *b*) Taper pin
- *c*) Valve seat

SAWS
- *a*) Hack, frames, 10 in., adjustable
- *b*) Hack-saw blades, 18, 20, and 24 teeth
- *c*) Hand

SCALES
- *a*) Steel, 6 in., graduated 1/64 and 1/100 in.
- *b*) Steel, 12 in., graduated 1/32 in.

SCRAPERS
- *a*) Bearing
- *b*) Carbon

SCREW DRIVERS
- *a*) 6 in. and 12 in.
- *b*) Small combination

SCREW EXTRACTORS
SCRIBERS
SNIPS — tin, 3 in. straight and 3 in. curved
SOLDERING COPPERS — 1, 2, and 3 lb. with handles
SPRING SPREADERS
STAMPS
- *a*) Figures, 3/16 in.
- *b*) Letters, 3/16 in.

TAP-AND-DIE SETS
- *a*) Machine screw
- *b*) N.F. ¼ in. to 1 in.
- *c*) N.C. ¼ in. to 1 in.

TIRE TOOLS
TOOL KIT — metal box or canvas roll, empty
TWIST DRILLS — (extra sets) selected sizes
VALVE
- *a*) Grinders (hand)
- *b*) Spring lifters

WRENCHES
- *a*) 8 in., 10 in., 12 in., and 18 in.
- *b*) Ignition sets
- *c*) Pipe, 10 in., 14 in., 16 in., and 18 in.
- *d*) Rim socket
- *e*) Socket sets, large assortment with case
- *f*) Spark plug
- *g*) Speed wrenches
- *h*) Standard end sets, ¼ in. to 7/8 in., N.C. and N.F.
- *j*) Valve-tappet wrenches

Automotive Shop—
Materials and Supplies

ABRASIVE CLOTH AND PAPER — aluminum oxide and silicon carbide
ACETYLENE GAS — in drums, for welding
ACID
ALCOHOL
BABBITT
BEARING BLUE
BEARING COMPOUND
BOLTS
- *a*) Machine, selected sizes
- *b*) N.F. selected sizes
- *c*) Stove, flat or round heads, selected sizes

BRAKE JUICE — ½-pt. cans
BRUSHES
- *a*) Paint
- *b*) Spark plug
- *c*) Spoke
- *d*) Steel
- *e*) Varnish

CHAMOIS
COIL-SPRING ASSORTMENT
COPPER TUBING
COTTER PINS — assorted sizes
CROCUS CLOTH
DISTILLED WATER
DRAIN COCKS
ELECTROLYTE
ENAMEL — AUTO PAINTING
GASKETS
- *a*) Copper asbestos
- *b*) Cork and felt
- *c*) Flange

GASOLINE
GREASE — cup, cans
KEROSINE
KEYS, WHITNEY — assorted
LACQUER — colors
LEAD
LUBRICANT — transmission
NAILS AND BRADS
NUTS
- *a*) N.F., castellated, square, hexagon, selected sizes and kinds
- *b*) N.C., square and hexagon, selected sizes
- *c*) Machine screw, selected sizes
- *d*) Wing, selected sizes

OIL
- *a*) Cylinder, light, medium, and heavy
- *b*) 600W
- *c*) Penetrating

OXYGEN — in drums for lead burning
PIG LEAD
PISTON-RING COMPRESSORS
RADIATOR HOSE
RIVETS — brake lining, 5/16 in., ½ in., and ¾ in. long.
SCREWS
- *a*) Flathead or roundhead, iron or brass, selected sizes and kinds
- *b*) Cap and machine, iron, or brass, selected sizes and kinds

SEALING COMPOUND
SHELLAC — ½-pt. cans
SHIM STOCK
SOAPSTONE
SOLDER — bar, wire, or self-fluxing wire
SOLDERING PASTE
SPELTER — for brazing
SPONGES — ½ lb.
STARTING CABLE
TACKS AND STAPLES — upholstery
TIRE
- *a*) Carcass fabric
- *b*) Cushion stock
- *c*) Inner-tube repair stock
- *d*) Patching cement
- *e*) Patches
- *f*) Putty
- *g*) Tread stock
- *h*) Vulcanizing

VALVE-GRINDING COMPOUND — coarse and fine
WASHERS
- *a*) Lock, assorted sizes
- *b*) Wrought iron

WASTE
WIRE — primary and secondary

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Questions and Answers

MATCHING A CHERRY FINISH ON VARIOUS KINDS OF WOOD

1136. Q.: I have an old antique chest of drawers made of a combination of cherry, basswood, soft maple, and yellow poplar; drawer fronts and end rails are cherry; top, poplar; back legs and end panels, basswood; front legs, soft maple. Finish has been removed and sanded to the bare wood. I would like to know the best procedure for refinishing to the standard cherry finish. — *J. L. C.*

A.: Sponge the entire piece with clean hot water to lift any bumps or dents which time may have given a chest of this antique type. Avoid touching with the bare hands while the wood is wet, or black spots may appear.

After drying thoroughly, sand clean with a 4/0 garnet finishing paper, avoiding any cross sanding.

Apply a stain of the non-grain-raising (NGR) type with a brush or spray gun, starting with the part you see the least and ending with that you see the most. This procedure will avoid handling trouble at any stage of the refinishing work. Be sure to follow the manufacturer's directions in staining so that you will get the shade you desire for the entire piece. Because of the large number of woods included it will require some skill with the brush to second coat the harder woods in order to match up the color of the whole piece.

For the finish, I would suggest the use of Du-Pont Company "Penetrating Wood Finish," following the directions on the can, or better yet the modified directions on page 123 of *Wood Finishing and Painting Made Easy* by Ralph G. Waring, published by The Bruce Publishing Company, 540 No. Milwaukee St., Milwaukee 1, Wis. This finish is very tough, easy to apply and can be touched up at any time without any difficulty since it was made for floor use but is particularly adapted to use on furniture of this type. — *Ralph G. Waring.*

HANDBOOK FOR LEARNERS OF TRADE PRINTING

B. H. THOMAS
Central High School
Oklahoma City, Okla.

Every printing teacher of day-trade classes has two major duties: first is that of effective individual instruction to achieve the greatest accumulation of salable knowledges and skills in his learners; second, is that of organization and management of an effective system of plant control.

Teachers who are good organizers are more effective in their teaching because they have more time to give to that major duty. There are others who allow themselves to get lost in plant details and consequently lose sight of their major duty of instruction.

I mean by plant details the constant repeating of the many hundreds of general instructions to each learner each semester regarding plant procedures, such as: cleanup, replacing tools, safety measures in machine operation, press wash-up, stock handling and where to place it, leaving the room, and many others. That practice took far too much of my time from individual instruction, and then, too, it gave me an unsatisfactory feeling of it being a "useless but necessary routine." Something must be done about it.

Since no teacher can anticipate and write down at one time the answers to the many

(Continued on next page)

American economic, social, and educational philosophy translated into practical educational organization and administration.

VOCATIONAL EDUCATION IN A DEMOCRACY

Revised edition

By

Chas. A. Prosser
Director
William H. Dunwoody Institute
1915-1945

and

Thos. H. Quigley
Head, Industrial Education Dept.
Georgia School of Technology

The previous edition of this book has made its mark. The basic soundness of its philosophy has been a potent influence in the progress of vocational education.

This new edition appears to be destined for the same signal service to vocational education. It is distinctive in that it is profound yet easily read. Its educational philosophy is in harmony with American thought; its economic philosophy is derived from those practices that have made America great; its social philosophy is that of American industrial society; and it translates these into practical educational administration and organization that is making — and will continue to make — democracy live.

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(Continued from previous page)

questions on simple details which learners spring so suddenly on teachers who thought the learner already knew, I made a note of each question, over a period of years, and compiled the answers, in instruction form, in a handbook. It was made a class project and several hundred copies were printed.

At the beginning of each semester each learner is given a handbook and a whole class period is given to reading it aloud, with each student taking part. Each item is discussed until each learner is satisfied he understands. Afterward, if a learner asks a question which is answered in the handbook, he is referred to it. That teaches him it is his responsibility to remember instructions on simple details given previously. If his copy has been misplaced, another hangs from a cord attached to the time card rack.

The time-consuming questions on simple plant procedure were eliminated. However, the handbook did not eliminate the necessity of checking to see that the procedures were followed through. Most teachers, I believe, will agree that necessity cannot be eliminated as long as we are dealing with learners.

It should be understood that the information in this handbook does not in any way take the place of individual instruction. Its purpose is only to make more of the teacher's time available for his major duty, and it has proved to be successful in our plant.

Learning a Trade

The business of learning a trade is a serious one. After a learner has definitely made up his mind to be employed on some job in the printing field, he should "hitch his wagon to a star," determine to be the best journeyman — a real craftsman in his work.

It takes more than determination and ambition and desire to become a craftsman — it takes constant work and study, and more work and more study.

In addition to constant work and study which enables a craftsman to plan, organize, create, and execute an original piece of work, he also develops certain character traits which make him a good citizen. Among these traits are:

A Craftsman Is Always: Prompt, dependable, busy, co-operative, fair, honest, courteous, clean, careful, ambitious, alert, saving.

Printing Plant Rules

Every printing plant has certain "ways" or procedures of doing jobs that develop in the course of manufacturing a piece of printed matter. Some plants call the procedures rules and regulations. In other plants they are not written and posted but are understood and performed by all workmen.

In order that learners may have definite information concerning the shop procedure in this plant, several rules are listed and explained here, and learners are expected to follow them from the beginning.

Leaving the Room: Any learner may leave the room at anytime (except between classes) for any purpose so long as the purpose is necessary and legal. In no instance should a learner leave the building during work time without the permission of the foreman. More than 15 minutes out of the room would be considered unreasonable, when loitering in the halls and personal visits would be a violation of school rules. In this connection learners

(Continued on page 41A)

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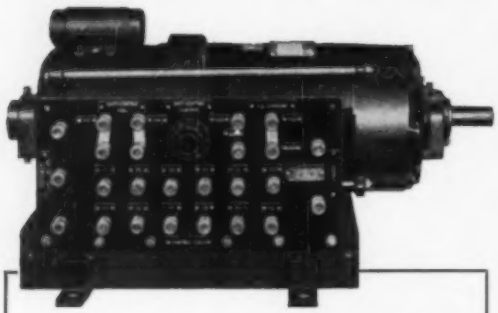

This amplidyne-generator is one of the units furnished with the General Electric Amplidyne Kit.

The General Electric Amplidyne Kit enables you to demonstrate every conventional type of field control. Specially designed for educational use, it has seven control fields, brought out to special terminals. Auxiliary components included with the equipment permit operation in voltage- or current-regulator applications, or as an amplidyne follow-up system. Vacuum tubes for electronic signal amplification are supplied. Components included permit demonstration of amplidyne and follow-up system principles.

The complete unit includes:

AMPLIDYNE MOTOR-GENERATOR (shown above)

SELSYN TRANSMITTER

SELSYN RECEIVER

GEAR MOTOR (1 4-hp)

TRANSFORMERS (Power and input)

VACUUM TUBES (2 Type 6L6, 1 Type 6SN7)

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GENERAL ELECTRIC

SHOP BOOKS

METALWORK, TECHNOLOGY and PRACTICE

By O. A. Ludwig. Revised 1947 edition. A complete textbook for metalwork — hand and machine. It presents usable information for machine shop, automotive, aeronautical, metal pattern working, foundry, sheet metal, ornamental metal, metal building and allied trades. Its 400 pages include over 660 illustrations, showing step-by-step procedures, tools, equipment, machines. Contents include: metalworking jobs, safety, reading drawings, sketching, material bills, layouts, electrical equipment, pipe-fitting, tubing, reaming, countersinking, tapping, soldering, brazing, welding, heat treating, molding, casting, grinders, metal finishing, stenciling, etching, and many other informative topics. $4.00. Order today.

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McKNIGHT & McKNIGHT
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McKNIGHT & McKNIGHT

(Continued from page 39A)

are placed on their honor to do the *right* thing. Doing the *wrong* thing repeatedly brands a learner as an undesirable member of the group.

Fees: A fee of 25 cents is charged all learners who take the I.T.U. apprenticeship lessons, and lose, fail to return, or damage a lesson beyond ordinary wear.

Each learner is required to provide himself with a Turtle's line gauge within three weeks after the semester begins. This costs about 80 cents.

Kind of Jobs Printed: Many years ago the board of education restricted the production of printed matter in this plant to two groups:

First, printing for school people within the school system, when the printing is used for school purposes. The jobs accepted, however, must be approved by the foreman, and must fit into the regular course of study.

Second, learners may print jobs for themselves, or immediate members of their family (father, mother, brother, sister) provided they pay for stock used. If a learner desires to print a job for himself he should make a layout and secure the foreman's o.k. No job of any kind is ever printed in this plant without the foreman's o.k.

Aprons, Line Gauges: At the present time this plant furnishes an apron for each learner, labeled with his name, and each is required to wear it. The line gauge should be attached to the apron, and the apron should *always* be hung upon the assigned hook at the end of the work period.

Notebook: Each learner is urged to keep a notebook containing copies of the jobs which he produces. A very interesting hobby for a learner, who is really serious, is the collection of jobs printed in other shops for study and analysis.

Job Envelope: Every job must have a job envelope, with instructions filled in, and learner's name at bottom. Copy should be kept in the envelope when not in use, and the envelope kept in the box on the wall. When the job is completed, the envelope, containing the copy and one copy of the completed job, should be placed in the box on the foreman's desk. Also a copy of the completed job is kept by the learner who printed the job and a copy laid on the foreman's desk.

Neither copy nor job envelope are lost in this plant nor any other printing plant.

Delivery Ticket: Any learner who delivers a printed job *must* prepare a delivery ticket, figure the cost, have the ticket signed by the customer and return the ticket to the box on the foreman's desk. Either get the customer's signature on the ticket or return the job to this plant for later delivery.

Platen Presses: The learner who uses a platen press last, each day, is responsible for washing the press before he leaves school for the day.

Vertical pressmen are responsible for the running condition of platen presses — for oiling, cleaning, checking and setting rollers, and for repair and maintenance. It is suggested that the vertical pressmen agree which individual is responsible for this work.

Proof Press: Keep paper and type out of the gears. Be sure there are no obstructions under the galley and type. Always have a sheet on the type before rolling the cylinder over. Never print on the cylinder tympan sheet. Use only news ink on proof presses. Job ink dries quickly and hard.

Library: There are about 100 books on every phase of the printing field in the school library, which may be checked out. Our own plant library contains many pamphlets, brochures, books, catalogs, and a collection of printed matter of various kinds which may be checked out for home reading, or for use during work hours.

Taking Things: At no time and under no condition should a learner take or allow anyone else to take out of this plant any paper, type, spacing material, ink, furniture, metal, books, pamphlets, or any other material or equipment of any kind belonging to this plant, without permission of the foreman.

Waste Paper and Bristol: Any learner who wishes to use waste paper or bristol on a job for himself *must* first ask the foreman.

Abuse of Tools and Machines: Carelessness leads to abuse of tools and machines. No printing plant will keep a journeyman on its pay roll who ruins its equipment. It's needless to state here that this plant is no exception to that rule. Be careful. Examples: Too much packing on the platen smashes type; dropping quoin keys on type forms smashes type; distributing type quads and spaces, leads, slugs, wood and metal furniture in wrong places, "loses" equipment.

Foundry Leads and Slugs, Brass Rules: Don't ever saw them, and don't dump them in with dead linotype metal. Put them in their proper places.

The Saw: Only make-up men and linotype operators are permitted to use the metal saw. Don't use the saw — ask a make-up man to saw your slugs. If he is not available the foreman will saw them for you.

The Stitcher: Secure the foreman's permission to use this machine. It must be "set up" for each job and only the foreman does that.

The Cutter: Learners *must* have instructions on this machine before they use it for the first time. Only one man at a time uses the cutter and he must *be sure* never to pull the control lever over unless his right hand is on the safety lever. Stay away from the cutter unless you are using it yourself. No watchers — no helpers — no volunteer assistants standing near by talking to the operator to distract him. He *must be careful* to observe safety precautions and avoid wasting stock by mistakes in cutting.

Lifting a Form: To lift a form properly, slide it toward you and grasp the far right corner of the chase with the right hand, and the far left corner with the left hand. Swing the form clear and release the left hand to carry the form with the right hand. Place the form on the press with both hands, from either the front or right side of the press, with the quoins at the top and right side. To handle the form in any other way is likely to result in smashed type or guides. In removing a form from the press grasp the chase in the same places, lift to the stone, resting the bottom of the chase on stone, then lay flat.

Stock Room: Learn how to open a package of paper. Never rip the front off. The label, giving name, size and weight is destroyed if the front is torn off, making identification difficult.

Keep the stock room clean. Don't throw paper on the floor — put it in the wastebasket at the end of the table. Don't tear off several wrong sizes of wrapping paper to wrap a package. Determine the size needed before tearing it off.

(Continued on page 42A)

I'M A SMART CHARACTER!

WELL, ANYWAY...

it seems like he has a college education when you give him a job on your drawing board.

SPEEDBALL PENS

are highly qualified for any art job. One dip distributes the ink between 3 reservoirs giving cleaner, more uniform strokes at any speed and many more strokes per dip. The hand tempered tips give long service.

4 DIFFERENT TIP STYLES IN 8 SIZES plus the popular Flicker Pen with round tips and easy-to-clean hinged feeders.

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Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH GRINDER
BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets
BITS
- a) Auger, ¼ in. to 1 in. by 16ths
- b) Auger, 11/16 in., 18 in. long
- c) Drill, for wood, square shank, ⅛ in. to ½ in. by 16ths
- d) Expansion
- e) Extension, 18 in.
- f) Screw driver, ¼ in.

BLACKBOARD — permanent or portable
BLOWTORCHES — 1-qt. size
BOOKCASE
BRACES — ratchet type, 8-in. swing
BULLETIN BOARD
CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.
CHAIRS — teacher's and tablet arm
COMPASS SAW
COIL
- a) Spreader
- b) Taper
- c) Winder

DESK — teacher's, with drawer compartments
DRILL
- a) Breast
- b) Concrete, ¾ in., ½ in., ¾ in., 1 in.
- c) Hand
- d) Portable, electric
- e) Twist, 1/32 in. to ½ in. by 32nds

DRILL PRESS
- a) Bench, hand, or power driven
- b) Heavy, power driven

FILES
FIRST-AID CABINET AND SUPPLIES
HACK SAW
- a) Blades, 10 in., 24 tooth
- b) Frames, adjustable

HAMMERS
- a) Claw, 12 oz.
- b) Machinist's, ball peen

HICKEY — ½ in. and ¾ in.
LATHE
- a) Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
- b) Speed

PLIERS
- a) Gas, 6½ in. and 8 in.
- b) Side cutting, 6 in.

PUNCH — for metal molding
PUNCHES — assorted
REAMERS
- a) Pipe burring, ¼ in. to 1 in.
- b) Pipe burring, ½ in. to 2 in.

RULES
- a) 48 in. zigzag
- b) 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.
SHEARS — for cutting metal molding
SOLDER DIPPERS
SOLDERING COPPERS
- a) Assorted
- b) Electric
- c) Handles

STOCKS AND DIES — for pipe threads, ½ in. to 1 in.
VISES
- a) Machinist's, 4 in.
- b) Pipe

WRENCHES
- a) Adjustable, 6 in. and 8 in.
- b) Pipe, 10 in., 12 in., and 14 in.
- c) Socket, combination

Electrical Shop—Supplies

ABRASIVE CLOTH — Aluminum oxide, 1, 1½, and 2 in. wide
ARMORED CABLE
- a) 2 wire, No. 14, single strip
- b) 3 wire, No. 14, single strip
- c) Box connectors

ATTACHMENT PLUG
BAR HANGERS
BATTERIES — dry cells
BATTERY ACID — 1.300
BATTERY SEALING COMPOUND
BOX CLEATS
BRADS — ¾ in., No. 19, and 1½ in., No. 16
BRAKE LINING — ¼ by 2 in.
BRUSHES — carbon, for motors and generators
BURGLAR CONTACTS
- a) Open circuit
- b) Closed circuit

BUSHINGS
- a) Loom, No. 1 and No. 2
- b) "Jiffy" loom No. 2

BUZZERS
CLEATS — unglazed porcelain, 2 wire
CLIPS — test, with insulators, Universal, Nos. 22, 23, 24, and 25
COMMUTATOR CEMENT
CONDUIT
- a) Bushings, ½ in., ¾ in., and 1 in.
- b) Box connectors, for flexible
- c) Couplings, for flexible
- d) Lock nuts, ½ in., ¾ in., and 1 in.
- e) Rigid, ½ in., ¾ in., and 1 in.

CONDULET
- a) Fillings, ½ in., LL, LR, and LB
- b) Covers, ½ in., blank

DOOR OPENERS — mortised
FISH PAPER — .0125 in. thick
FIXTURES — brass chain, suspension
FIXTURE STUDS
FUSES
- a) Plug type, renewable, 125 volt, 15 amp.
- b) Cartridge type, renewable, 125 volt, 30 amp.
- c) Renewals for plug fuses
- d) Renewals for cartridge fuses

GROUND CLAMPS — ¾ in. to 1 in., assorted
HICKEY GRIPS — ½ in. and ¾ in.
LAMPS
- a) Carbon, 220 volt, 60 watt
- b) Mazda, selected as wattages and voltages
- c) Guards for brass sockets

LEATHER NAIL HEADS
LUGS — 25 and 50 amp.
LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides
MOLDING
- a) Metal
- b) Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing
NUTS — iron, 4–36, 6–32, 8–32, 10–24, 12–24, 10–32, 14–20
OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening
PIPE STRAPS — galvanized, ¾ in., ½ in., ¾ in., and 1 in.
PUSH BUTTONS
- a) Return call, 3 point
- b) Single

RECEPTACLES
- a) Flush, duplex
- b) Porcelain cleat, 660 watt, 250 volt
- c) Concealed
- d) Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries
RELAYS — Dixie
RESISTANCE BOARDS — for testing
RESISTANCE UNITS — 125-ohm
RHEOSTATS
- a) Compression, 275 watt
- b) Field, for shunt and compound motors

ROSETTES — wood
ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.
SCREWS
- a) Anchors, 8/32, 10/24, 12/24, 14/20
- b) Machine, roundhead, 4–36 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ¾ in., 8–32 by ½ in., 8–32 by 1 in., 10–32 by ¾ in., 10–24 by ¾ in., 10–32 by ¾ in., 10–24 by 1 in., 10–32 by ¾ in., 12–24 by 1 in.
- c) Machine, brass, roundhead, 4–36 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ½ in.
- d) Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in., No. 8 by 1½ in., No. 7 by 2 in.
- e) Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red
SOCKETS
- a) Brushed, brass pull chain, keyless, key
- b) Porcelain, keyless, with caps
- c) Porcelain, key, with caps

SOCKET CAPS — ½ in. and ¾ in. bushed
SOLDER WIRE — 50/50, size No. 10
SOLDERING PASTE — 2 oz. cans, noncorrosive
SOLDERING SALTS — 1-oz. cans, noncorrosive
SPEED COUNTERS — 0–9999
SPLIT KNOBS — porcelain
SPRING BALANCES — 0–30 lb.

(Continued on page 44A)

(Continued from page 41A)

Waste from the cutter 3 x 4 in. and larger and bristol strips 1½ in. or wider must be banded and placed on the shelves at rear of stock room.

Be sure the stock you take out of its original package is what you want. It's almost impossible to replace sheets without spoiling some. Paper is expensive and someone must pay for it.

Every learner is responsible for *knowing* and recording on job envelope the exact number of sheets, kind, size, and weight which he takes from the stock room.

Don't move package down from upper shelves or from one shelf to another without permission of the foreman.

Safety on Machines: Platen press operators — set your speed *slower* than you can feed — fast speed increases the desire to grab a sheet when the press is closing. Keep your hands out of the press — don't take chances by grabbing. Don't allow loiterers to talk to you. You can't operate a press and carry on a conversation at the same time. Always get final o.k. from the foreman. Keep the color up.

Linotype operators — keep your fingers out of the machine when it is turning over — shut off the control lever, then make adjustments.

Keep your fingers out of the saw.

Use safety mask when trimming stereotypes. Be careful — be sure!

Vertical pressmen — stop the press and kill the motor to make adjustments. If this is followed in every instance there is not likely to be any injury. Keep your hands and arms out of the press, while it is running. There are *no one-armed pressmen.* Keep your mind on your job. Don't talk to watchers or passersby, nor yell at other workmen. Suit ink to paper, set counter and know exactly how many copies you run on each job. Always get final o.k. from foreman, and keep color even.

Only one learner is authorized to operate the cutter. All others must keep away. No volunteer helpers, except by permission of foreman. Operator *must* keep his right hand on the safety lever before pulling the control lever with the left hand. Figure your stock correctly — be sure you place stock in the cutter the same "way" you figured it. Placing it in the cutter the wrong way will always result in waste. Stock, in almost every case (always in the case of cards) should be cut

(Continued on page 51A)

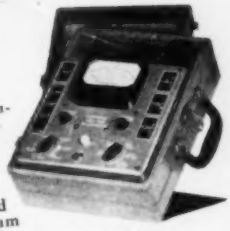
Dependable...Rugged INSTRUMENTS

for electrical and electronic instruction

Standardize on WESTON instruments throughout your electrical courses, and thus be sure your students are thoroughly familiar with the instruments they will use all through their working careers. Accurate, economical, rugged and dependable types available for all laboratory and classroom needs. Literature on request. WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey.

ELECTRONIC ANALYZER

Three-in-one instrument. Provides self-contained Volt-Ohm-Milliammeter, high impedance electronic Volt-Ohmmeter, and probe type Vacuum Tube Voltmeter for use to 300 megacycles.



Model 769

Model 280

D-C MINIATURE INSTRUMENTS

Single and multi-range voltmeters, ammeters, voltammeters available. Accuracy within 1%. Hand calibrated scales. Knife-edge pointers, mirrored scales eliminate parallax errors.

SUPER-SENSITIVE ANALYZER

Volt-Ohm Milliammeter, 26 ranges, temperature compensated, D-C voltage ranges have either 1000 or 20,000 Ohms per volt sensitivity. Precision resistors used throughout. Solid oak carrying case. Small, light, compact.

Model 779

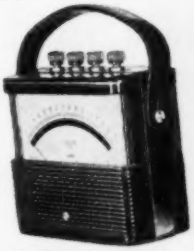
Model 697

VOLT-OHM-MILLIAMMETERS A-C D-C

Carefully selected group of ranges for A-C, D-C voltage measurements, direct current and resistance values. 1000 Ohms per volt sensitivity. Self-contained battery . . . equipped with test leads.

D-C PORTABLE INSTRUMENTS

Highly shielded single and multi-range voltmeters, ammeters, milliammeters and microammeters. Temperature compensated . . . hand calibrated mirror scales. Accuracy within ½ of 1%.



Model 931

STUDENT GALVANOMETER

Available with or without base. Widely used in school instruction where dependability and low cost are paramount. Sensitivity: 22 microamperes. Resistance: 23 Ohms. Scale: 30-0-30. Medium and extreme sensitivity models also available.

Model 375

D-C MINIATURE PORTABLE INSTRUMENTS

Rugged, serviceable for all-around use. Available in single, double, and triple ranges for voltage measurements; single and double ranges for current measurements. Accuracy 2%.

Model 489

WESTON INSTRUMENTS

ARMSTRONG
Drop Forged
LATHE DOGS

ARMSTRONG Lathe Dogs give extra service because they are drop forged from selected open hearth steel, and, are heat treated to extreme toughness and stiffness. Hubs are made large enough to permit re-tapping, screws are also of special analysis steel and are hardened at the point to prevent upsetting. ARMSTRONG Dogs come in 10 types with square head or safety headless screws, with straight or bent tails. They are carried in stock by your local ARMSTRONG Distributor.

Write for New S-48 Catalog, just released.

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The JOHNSON
"Triple-Treat"

Ideal for School Shops

As illustrated, $514.00 F.O.B. Factory

A COMPLETE HEAT TREATING DEPARTMENT

This compact unit consists of the following JOHNSON Furnaces mounted on a steel bench. It is designed to meet all heat treating requirements of the small shop.

- Pot Hardening Furnace for salt and cyanide hardening, and for melting soft metals. Pot size 6" diameter x 8" deep.
- Hi-Speed Steel Furnace for heat treating high speed steels, carbon steels, dies and tools. Temperature range 1400 - 2400° F. Firebox 7 x 13 x 16½.
- Tempering Furnace for pre-heating, tempering and drawing. Temperatures up to 1200° F. Firebox 5 x 7¼ x 13½.

FREE CATALOG
Describes all famous JOHNSON Furnaces for melting, annealing, tempering, case hardening, etc. Write for copy.

JOHNSON GAS APPLIANCE CO.
585 E AVENUE N.W. • CEDAR RAPIDS, IOWA

(Continued from page 42A)

STARTING BOXES
- a) For compound motors, various makes
- b) For shunt wound, 1 h.p., 110-volt motors. Overload release
- c) For shunt wound, 1 h.p., 110-volt motors. No voltage release
- d) Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt

SWITCH
- a) Battery, 4 point
- b) Bases, porcelain, for 10-amp. switches
- c) Boxes, 2¾ in. deep
- d) Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
- e) Entrance, safety, 3 pole, 30 amp., 250 volt
- f) Flush, push button, S.P., D.P., 3 way, 4 way
- g) Surface, S1, S3, and S4
- h) Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
- i) Surface, snap, electrolier
- k) Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required

TACKS — double-pointed No. 10

TAPE
- a) Friction, ½-lb. rolls
- b) Rubber, ½-lb. rolls

TELEGRAPH SETS — including sounders, keys, and relays

TELEPHONES
- a) Complete bridging, independent phones
- b) Couch vestibule telephones
- c) Receivers, transmitters, induction coils, condensers, and bridging switch hooks

TRANSFORMERS
- a) Bell ringing, 6, 8, 14 volt
- b) Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 5/16 by 10 in.

TUBING — flexible nonmetallic, ¼ in. and ⅜ in.

WASHERS
- a) Iron, ¼ in. and ⅜ in.
- b) Brass, ¼ in. and ⅜ in.

WIRE
- a) Annunciator No. 18 or No. 20
- b) Fixture, No. 18, single yellow, with marker
- c) Rubber covered, solid copper, No. 10, black
- d) No. 10, white
- e) No. 14, black
- f) No. 14, white
- g) Rubber covered, No. 16, brewery cord
- h) No. 18, lamp cord, green and yellow
- i) S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equip.

ANNUNCIATORS
- a) Automatic needle drop
- b) Gravity drop
- c) Manual needle drop

ARMATURES — burnt out, for repairing

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
- a) Air, single pole, overload, 25 amp., 550 volt
- b) Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
- a) For multiple-speed motor
- b) For 1 h.p., 110-volt series motors

GENERATORS
- a) Motor-generator set, 10 h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
- b) Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
- c) Auto generators of different makes

GRAVITY CELLS

MAGNETS — testing, 10,000 ohm

METERS
- a) Ammeter, standard, 60 amp., a.c.
- b) Ammeter, standard, 60 amp., d.c.
- c) Ammeter, student, 60 amp., a.c.
- d) Ammeter, student, 60 amp., d.c.
- e) Voltmeter, standard, 0–10 volt,
- f) Voltmeter, standard, 110–220 volt, d.c.–a.c.
- g) Voltmeter, standard, 125 volt,
- h) Voltmeter, standard, 125 volt, d.c.
- j) Voltmeter, student, 110 volt, d.c.
- k) Voltmeter, student, 110 volt, a.c.
- l) Wattmeter, standard, 110–220 volt, 30–60 amp., d.c.–a.c.
- m) Wattmeter, student, 110–220 volt, 30 amp., a.c.–d.c.
- n) Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
- a) Auto starter, different makes
- b) Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
- c) Compound, 1 h.p., 110 volt, d.c.
- d) Multiple speed, 1 h.p., 3 phase, 220 volt
- e) Series, 1 h.p., 110 volt, d.c.
- f) Shunt, 1 h.p., 110 volt, d.c.
- g) Split phase and repulsive, a.c., 110 volt, single phase, assorted
- h) Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
- j) 3 phase, 1 h.p., a.c., 220 volt, various makes
- k) 3 phase, 2 h.p., 220 volt, a.c., various makes
- l) Universal, fractional h.p., 110 volt, different makes
- m) Universal, variable speed, ⅓ h.p.

PLATFORM SCALE — 100 lb. capacity

SPECIFY Hotpack EQUIPMENT

For Long Satisfactory Service

Look at These Features and Compare

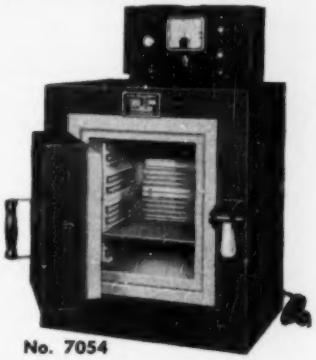
Hotpack ELECTRIC HEAT TREATING FURNACES

Simple to Operate: Due to the AUTOMATIC CONTROLLING-INDICATING PYROMETER, you can HEAT TREAT small parts, tools and dies.

Just turn the indicator to the temperature you want — leave it until you are ready, nothing else to do.

Economical to purchase — Economical to operate.

This new Hotpack Electric Furnace is fast heating, built for continuous use from 300° F. to 2000° F. It is the only Furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limitstat control in this price field.



No. 7054

SPECIFICATIONS

Model	Interior Size W. D. H.	Current Characteristics	Shipping Weight	Price F.O.B. Phila.
7056	8"x 8"x 5½"	110 V-AC-15 Amp.	100 lbs.	130.00
7054	8"x 8"x11"	115 V-AC-15 Amp.	220 lbs.	$175.00
7055	12"x12"x11"	220 V-AC-23 Amp.	400 lbs.	275.00

No. 7004

NEW Hotpack ELECTRIC CERAMIC KILNS

Designed for Use in Art Courses in the School

1. Eye level controls — pilot light.
2. Built-in pyrometer for visible accurate temperature indication.
3. Handles are cool to touch.
4. Control switch — low, medium and high heat for even distribution.
5. Special insulation holds heat and prevents scorching of table top.
6. Shipped ready for immediate operation, plugging into any 115 volt outlet. No special line required.

SPECIFICATIONS

Model No.	Interior Size	Cubic Inches	Shelves Furnished	Max. Temp.	Approx. Time	Electrical Characteristics	Ship. Wgt.	Price F.O.B. Phila.
7006	8"x 8"x 5½"	352	1	2050° F.	3 hrs.	115 V-15 Amp.-1725W	100 lb.	60.00
7004	8"x 8"x11"	704	2	2050° F.	4 hrs.	115 V-15 Amp.-1725W	220 lb.	$ 87.50
7005	12"x12"x11"	1584	2	2050° F.	3 hrs.	220 V-15 Amp.-4830W	400 lb.	187.00

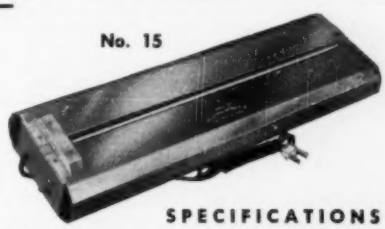
THE NEW Hotpack ELECTRIC PLASTIHEETER

Designed for Use in Plastic Courses in the School

The HOTPACK PLASTIHEETER is a commercial type strip heater designed to heat sheets of Plexiglas or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ½" thickness in from 30 seconds to 2 minutes depending on the thickness of the material. As the material does not come into contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.

Send for Detail Catalogs

No. 15



SPECIFICATIONS

Working Space: 18" long x 5" wide platen. Overall Size: 21" long x 7" wide x 3½" high. Heating Unit: 20" long. Off-On Switch. Electrical Characteristic: 115 Volt — AC or DC — 200 Watts. Approximate Shipping Weight: 4 lbs. **Price Complete: $15.00 F.O.B., Phila.**

THE ELECTRIC Hotpack COMPANY, INC.

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MACMILLAN
60 Fifth Avenue
New York 11, N. Y.

Texts for Vocational Courses

MOTOR TUNE-UP MANUAL

By Ralph J. Everest — *To be ready in May*

The basic operating principles of the automobile engine are clearly explained in this book together with complete instruction in each step of the over-all tune-up job. It gives the mechanic the knowledge he needs in order to be sure that the adjustments he makes will accomplish the desired results. There is full explanation, for instance, of the electrical principles of batteries, starter and ignition systems, meters, etc. as well as instruction in analyzing meter and indicator readings accurately. Nearly 200 illustrations provide excellent visual aid. You will find this a highly usable text for auto mechanics courses.

AIRCRAFT MECHANIC SERIES

By R. H. Drake

Aircraft Engines, $5.90. Aircraft Welding, $4.00. Aircraft Sheet Metal, $5.50. Aircraft Woodwork, $3.50. Aircraft Electrical Systems, Hydraulic Systems & Instruments; Aircraft Maintenance & Service; Aircraft Engine Maintenance & Service, preparing.

These books provide very clear, complete texts on all aspects of aircraft mechanics. The underlying theory, materials and techniques are fully explained and illustrated, and there are projects for shop practice. Completely up-to-date and authoritative, these books provide all the instruction required by those planning to take the examinations for CAA aircraft and engine certificates and specialists' ratings.

THE BLUEPRINT LANGUAGE

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Thoroughly explains every detail of blueprints, with abundant illustrations and problems reproduced from blueprints and drawings contributed by over 100 leading manufacturing concerns. Gives especially good training in visualization.

ILLUSTRATED JIG-TOOLING DICTIONARY

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A unique reference containing working drawings, with concise explanations, of the design, construction and use of 1000 pieces of tooling equipment and tooling procedures.

INTRODUCTION TO PRACTICAL RADIO

By Tucker $3.00

An unusually thorough basic text on all fundamentals, with full explanations of the necessary mathematics at points where it is used. Many practical problems. Fully illustrated.

PRINCIPLES OF RADIO FOR OPERATORS

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Very clear, simple explanations of the electrical fundamentals and operating principles of every basic part of radio. Nearly 500 illustrations. Class demonstrations. Many exercises.

MACHINE SHOP OPERATIONS

By King

Clear directions, with all necessary technical data. Many illustrations. Lathe Operations, $1.75; Milling Machine Operations, $1.75; Shaper Operations, $1.00. *Preparing:* Bench, Grinder Operations:

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School Bureau, Pencil Sales Dept. 12B-J3, Joseph Dixon Crucible Co., Jersey City 3, N. J.

(Continued from page 34A)

Dr. Coover, director of industrial arts at California State Teachers College, spoke about the New State Industrial Arts bulletin which is in the process of revision at the present time. The right-hand corner picture shows the members of the staff.

A discussion was held on diversified shop training, and the revision of some of the present courses.

♦ On December 12, 1948, an Epsilon Pi Tau initiation ceremony was held at the Oswego State Teachers College of Oswego, N. Y.

The following men were examined, found qualified, and were initiated into Oswego's Phi Chapter.

Phi Chapter — Epsilon Pi Tau. Twenty-four initiates at Oswego State Teachers College

Front row, from left: Robert Nicholson, Charles Trabold, Glenn Thompson, Edward Vanca, Eberhard Thieme, Sheldon Boyd, Arthur Miller, David Wray

Second row: Thomas Genovese, Ivan Beams, Clarence Parry, Lorenzo Bloom, Rodney Pierce, Vincent Carlen, Otis White, William Walker

Third row: Milton Goldin, Carl Allen, Richard Marsters, Arthur Pelton, Irving Firman, Arthur Engdahl, Charles Stebbins, and Elbert Baker

♦ The first meeting on the calendar of the Trade and Industrial Education Association, Pittsburgh, Pa., was the institute meeting, held in the Central Catholic High School auditorium, on Friday, October 15, 1948, at 1:30 p.m.

The speakers for the afternoon were Dr. S. L. Coover, State Teachers College, California, Pa., and R. Greiner. Dr. Coover spoke on "Life and Education in South America," and Mr. Greiner, manager of the training department, Allis-Chalmers Mfg. Co., Milwaukee, Wis., discussed "The Need for Industry and Schools to Co-operate."

Both speakers illustrated their talks with movies.

♦ The New Jersey Vocational and Arts Association has changed the Asbury Park convention dates from April 7, 8, and 9, to March 17, 18, and 19. Headquarters will be at the Berkeley-Carteret Hotel.

♦ The next meeting of the President's Conference on Industrial Safety will be held on March 23, 24, and 25, 1949, in Washington, D. C.

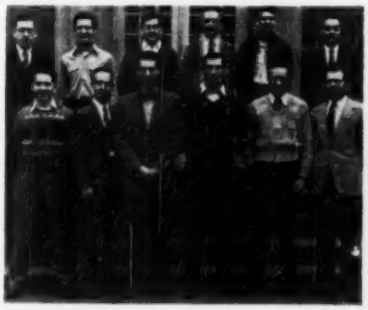
Members of the committee on education are L. H. Dennis, executive secretary of the American Vocational Education Association; DeWitt Hunt, Oklahoma A. & M. College, Stillwater, Okla.; and Roy R. Van Duzee, West Allis School of Vocational and Adult Education, West Allis, Wis.

♦ The spring conference on industrial education, sponsored jointly by the College of Education of the University of Missouri and the industrial-education section of the Missouri State Department of Education will meet at the University of Missouri, Columbia, Mo., on Friday and Saturday, April 22 and 23.

♦ The National Society for the Prevention of Blindness will hold a three-day national conference, March 16, 17, and 18, 1949, at the Hotel New Yorker, New York City.

Details concerning the program may be obtained by writing directly to the Society at 1790 Broadway, New York 19, N. Y.

♦ The main speaker at the meeting of the Trade and Industrial Education Association, Pittsburgh, Pa., in December, was Dr. Louis Land, director of vocational education, Pennsylvania State Teachers College. Dr. Land, who was appointed chairman of the appraisal committee, which is to evaluate "Connelley," also introduced the members of his appraisal committee.



College industrial-arts publication staff. State Teachers College, California, Pa.

Front row, left to right: Haas, Davis, Pivivotti, McKelvey, Aymm, Johnson

Back row, A. C. Wenzel, faculty advisor, Grigutis, Oveski, Shippling, Hicks, and A. S. Stavaski, printing advisor

Woodworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH
- *a)* Shop, with hardwood tops, 1¾ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.

  It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
- *b)* Glue
- *c)* Stain, with metal-covered top
- *d)* Teacher's demonstration

BLACKBOARD — permanent or portable

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
- *a)* Automatic knife, direct-motor-type. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
- *b)* Bench, hand or power
- *c)* Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
- *d)* Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
- *a)* 6-in. or 8-in. portable jointer. Table to be fitted for rabbetting. Safety-cylinder type, equipped with safety guard
- *b)* 12, 16, or 18 in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbetting. Jointer to be equipped with safety guard

LATHES
- *a)* 6-in. to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block
- *b)* Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable-speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
- *a)* Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod
- *b)* Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12, 18, 20, 24, or 30-in., motor or belt-driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible

SANDER
- *a)* Belt, direct motor drive
- *b)* Disk, motor or belt driven
- *c)* Oscillating spindle, motor driven
- *d)* Portable, hand-plane type, direct motor drive
- *e)* Vertical spindle and disk sander

SAWS
- *a)* Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
- *b)* Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded
- *c)* Cutoff, pedestal or swing type to be fitted with 12-in. to 16-in. saw
- *d)* Filing machine, direct motor drive
- *e)* Jig, direct motor or belt driven
- *f)* Portable band saw, 14 to 20 in. ball bearing, motor driven
- *g)* Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
- *h)* Universal saw bench, 14 to 18 in., motor driven
- *i)* Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
- *a)* Motor drive, single or double spindle. Table to be equipped with removable center plate
- *b)* Portable shaper or router with a suitable selection of cutters

TENONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class)

Woodworking—Small Tools

AWLS — brad, assorted sizes

BEVELS
- *a)* Protractor
- *b)* Sliding T, 8 in.

BITS
- *a)* Auger, 3/16 in. to 1 in. inclusive, by 16ths
- *b)* Auger, 3/16 in. to ½ in. inclusive, by 16ths
- *c)* Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
- *d)* Countersink, for wood, rose pattern, ½ in. and ⅝ in.
- *e)* Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in
- *f)* Expansive, ⅜ in. to 1½ in.
- *g)* Expansive, ¾ in. to 3 in.
- *h)* Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
- *i)* Screw driver, square shank, ¼ in., 5/16 in., ⅜ in.
- *k)* Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths
- *l)* Twist drill, straight shank, 1/16 in. to ⅜ in., inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
- *a)* Bench duster, 10 in.
- *b)* Floor
- *c)* Glue, round, 1½ in. and ⅝ in.
- *d)* Glue, round, 1½ in.
- *e)* Marking, camel's hair, No. 1 and No. 2
- *f)* Varnish, flowing, 2 in. and 2½ in.
- *g)* Varnish, flat, ½ in., ¾ in., and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
- *a)* Sets containing 6 tools
- *b)* Sets containing 12 tools

CHISELS
- *a)* Cold, machinists', ⅜ in. and ½ in.
- *b)* Mortising chisel and bits, ¼ in. to ⅝ in. by 16ths
- *c)* Socket firmer, bevel edge, ¼ in., ½ in., ½ in., ¾ in., 1 in., and 1½ in.
- *d)* Socket firmer, plain edge, ½ in., ¾ in., and 1 in.
- *e)* Tanged firmer, bevel edge, ¼, ½, ½, ¾, 1, and 1¼ in.

CLAMPS
- *a)* Bar, 24, 36, 48, and 60 in.
- *b)* Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

(Continued on page 50A)

News Notes

♦ Applications for fellowships in gas technology at the Institute of Gas Technology at the Illinois Institute of Technology will be accepted until March 15, 1949.

Fifteen fellowships paying $125 per month for ten months, with increases in the monthly stipend in following months, are available. Formal appointments will follow the application deadline.

Two-year fellowships lead to master's degrees and additional two-year fellowships are available for work leading to the Ph.D. degree.

Seniors and graduates under 28 in chemistry, chemical engineering, mathematics, mechanical engineering, and related fields are eligible.

The Institute of Gas Technology is an industry-sponsored research and educational institution affiliated with Illinois Tech. Application blanks should be addressed to the Director, Institute of Gas Technology, Technology Center, Chicago 16, Ill.

♦ A new 4-page folder titled "FM Telemetering Transmitters" has been announced by New York University College of Engineering, 181 Street & University Avenue, New York 53, N. Y.

Amply illustrated with photos and circuit diagrams, the text describes unique new equipment designs which have been developed as part of a specially sponsored research project.

The author explains that the units were originally designed for use with weather balloons, but can be applied to other services where lightweight low-drain transmitters are required, for example, in point-to-point communication.

The folder not only gives construction details with ratings for radio components but also explains care and adjustment of the apparatus. Address all requests for the folder to V. W. Palen, Bureau of Public Information enclosing 10 cents per copy to cover cost of handling and mailing.

♦ A portrait of Burton E. Nelson, ex-president of The Stout Institute, Menomonie, Wis., was unveiled at the institute during homecoming week in the Harvey Memorial Hall.

Dr. George New was commissioned to paint the portrait which will be added to the series of paintings of presidents of the college.

♦ JOHN F. RIDER announces the new Rider Public Address Equipment Manual Volume I. Currently available at all Ridge jobbers, the new manual contains 2024 fact-packed pages, the servicing data of 147 p-a equipment manufacturers. It embraces a ten-year span — 1938 to date. Bound in the standard Rider durable looseleaf binder, the book is compiled alphabetically for quick reference. It is a companion to the "How it Works" book, which describes the special circuits found in various p-a systems. The book costs $18.

♦ For the first time at the University of Pennsylvania, an advanced course for the discussion of problems in teacher education is being offered by staff members of the department of education. Dean E. D. Grizzell is chairman and co-ordinator

(Continued on page 58A)

WALLACE *woodworking* WONDERS

for your shop this year

BETTER CRAFTSMANSHIP
INCREASING ECONOMIES
PERFECT SATISFACTION

WALLACE wood-working machines are truly "wonder-working" machines. Because they turn out such wonderful work! When you INSTALL them — and actually USE them — you will always wonder why you got along without them. They are, indeed, the very ACME of Quality, Strength, and Performance!

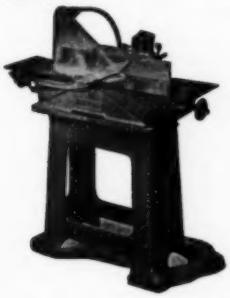
(Above)
WALLACE NO. 11 —
UNIVERSAL SAW

With tilting arbor — cuts are made at any angle. Motor and spindle ball-bearing equipped. Fast, smooth, safe cutting. Gear-driven; motors up to 2-H.P. Economical, accurate!

WALLACE

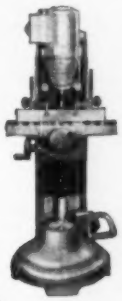
(Below)
WALLACE NO. 10 —
8" JOINTER

20,800 bites per minute with geared motor drive. All-steel cutter-head with four adjustable skew-set knives. No other Jointer equals its faster, smoother performance!!



(Above)
WALLACE NO. 16 —
16" BAND SAW

New high speed, 1100 r.p.m., gives a blade speed of 4600 lineal feet per minute. Smoother, faster production. Gear drive permits optional speeds. Other distinctive features. Strongly built — to last!



(Above)
WALLACE NO. 9 —
MORTISER

All moving parts exactly centered with slide rods insuring accurate and effortless operation. Motor has patented non-leaking bearings; keeps out oil and dust. Bit capacity up to 1" square.

Let us show you: why WALLACE MACHINES are built better; why they do better work; and liquidate their installation costs, often in a short time. It always pays to buy the best.

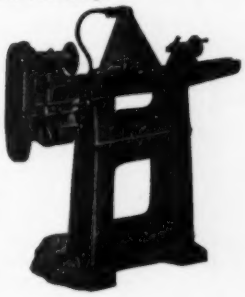
(Above)
WALLACE NO. 28 —
HY-GEAR SHAPER

Geared up to a spindle speed of 10,000 r.p.m., this Shaper produces smoother, faster, superior work. Right and left rotation facilitates set-up; eliminates sanding.

WALLACE

(Below)
WALLACE NO. 46 —
MULTI-SPEED LATHE

Built on a new principle. Headstock swivels, large face-plate turning done in front of lathe. 9-speeds, uniformly graded, 550 to 2400 r.p.m. Unlimited capacity and versatility!



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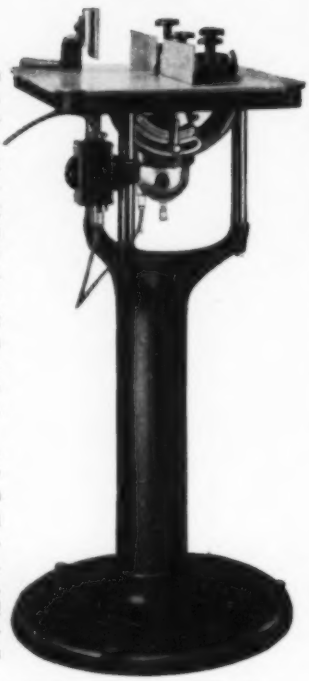
140 So. California Avenue . . . . Chicago 12, Ill.

Teach shaper operations SAFELY with a Stanley-Carter S5A-1 h.p. Table Shaper



STUDENTS learn with safety on a Stanley-Carter Table Shaper. Cutters are solid, one piece, and are about 1⅛" diameter. Due to the tilting of the arbor, cuts can be made with these small cutters that require a 2½" diameter cutter on the straight spindle shaper. High speed, 18,000 r.p.m. motor gives smooth free cutting operation . . . without chatter.

Tilting arbor feature with degree plate permits tilting cutters backwards to 45° and forward to 15° to increase variety of cuts. For easy adjustment, simply turn threaded ring on the motor casing one quarter turn for each 1/32" depth.

Base, pedestal and table, heavy cast iron. Table, 16½" x 22½", 37" from floor, is scraped and flaked. Drilled and tapped for either straight or circular guide. Not only a safe power tool for the school shop but a real industry tool. Write for illustrated, informative booklet. Stanley Electric Tools, Stanley-Carter Sales Dept., 536 Myrtle St., New Britain, Conn.

THE GREATEST NAME IN TOOLS

STANLEY

Reg. U. S. Pat. Off.

HARDWARE • HAND TOOLS • ELECTRIC TOOLS • STEEL STRAPPING

(Continued from page 48A)

c) Malleable-iron C, 4, 6, and 8 in.

DIVIDERS — wing, 6 in. and 10 in.

DOWEL PLATE — 6 in. long

DOWELING JIGS — with bushings

DRAWKNIVES — 7 in.

DRILL
- a) Automatic hand, with 8 drill points
- b) Chuck, 0 to ⅜ in.
- c) Hand, 0 to ⅜ in., for round-shank drills
- d) Star, for concrete, ½ in. and ¾ in.

FILES
- a) Auger bit, assorted, 6 in.
- b) Cabinet, 8 in. and 10 in.
- c) Card and brush
- d) Flat, wood, 10 in.
- e) Mill, bastard cut, 12 in.
- f) Round, bastard cut, 12 in.
- g) Taper, slim, 5½ in. and 7 in.

FIRST-AID CABINET AND SUPPLIES

GAUGES
- a) Bit, adjustable
- b) Jointer
- c) Marking, metal or hardwood
- d) Mortise, metal or hardwood
- e) Panel

GLASS CUTTER

GOUGES
- a) Tanged firmer, outside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
- b) Tanged firmer, inside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
- c) Spoon, ½, ¾, and 1 in.

HAMMERS — claw, bell faced, 10, 12, 13, and 16-oz.

HATCHET — bench, 4-in. cut

JARS — earthenware, 1-qt. capacity

KNIVES
- a) Jointer, to fit power machine
- b) Planer, to fit power machine
- c) Sloyd, 3-in. blade

LEVELS
- a) Wood, 24 in.
- b) Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head

NAIL SETS — 1/16 in. and 3/32 in. points

OILERS — bench, 1/3 pt., coppered, best grade

OILSTONES
- a) 1 by 2 by 8 in. in iron box
- b) Gouge slip, medium, 4½ by 2⅛ by ⅝ by 5/16 in.
- c) Gouge slip, fine, 3 by 2 by ⅜ by ⅛ in.

PINCERS — 6 in. carpenters'

PINCH DOGS — ¾, 1, and 1¼ in.

PLANES
- a) Block, adjustable, 6 in. long, 1⅝-in. cutter
- b) Circular
- c) Combination, adjustable
- d) Core box
- e) Duplex, fillister and rabbet
- f) Fore, ½ in., 2⅜-in. cutter
- g) Irons, double
- h) Jack, 14 in., 2-in. cutter
- i) Jointer, 24 in.
- k) Round, wood, 1¾ in.
- l) Router
- m) Smooth, 9 in., 1¾ in. or 2-in. cutter

PLIERS
- a) Roundnose, 5 in.
- b) Side-cutting, 6 in.

PUTTY KNIVES

RASPS — half round, wood, 10 in.

RULES
- a) Board
- b) 1 ft. or 2 ft. graduated by 8ths and 16ths
- c) Shrink, ⅛ in., 3/16 in.

SAWS
- a) Back, 12 in., 14 point
- b) Band, to fit power machine
- c) Compass, 10 in.
- d) Coping, frames
- e) Coping, blades
- f) Crosscut, 9 tooth, 22 in. long
- g) Crosscut, circular for power machine
- h) Dado, ⅛ in. to 1 1/16 in. to fit power-saw arbor
- i) Hack, frames, 10 in. or adjustable
- k) Hack, blades, 10 in.
- l) Keyhole, 10 in., 10 point
- m) Rip, 7 point, 22 in. long
- n) Rip, circular for power machine
- o) Set, 10 points per inch and finer
- p) Set, 10 points per inch and coarser
- q) Turning frame, 14 in.
- r) Turning blades, 3/16 by 12 in., 10 tooth
- s) Miter box, 24 by 4 in. saw, 7-in. capacity at miter

SCRAPERS
- a) Cabinet
- b) Glue, triangular
- c) Veneer, blade, 2¾ in. long, handle 11 in. long

SCREW DRIVERS
- a) Cabinetmakers', 4, 6, and 8 in.
- b) Quick return, spiral ratchet

SHOOT BOARD — and plane

SNIPS — tinners', forged steel, 2½-in. cut

SPOKESHAVES — adjustable, raised handle, 10 in. long

SQUARES
- a) Combination, 12 in.
- b) Try-, iron handle, 8 in.
- c) Framing, 2 ft.

STEEL FIGURES — hand cut, ¼ in.

TAPELINE — 50 ft., steel

TRAMMEL POINTS — adjustable metal frame, steel points

TURNING TOOLS
- a) Calipers, 6 in. inside and outside
- b) Calipers, 12 in. inside and outside
- c) Parting tools, ⅛ in.
- d) Round point, ¼ in., ½ in., ¾ in.
- e) Spear point, ¼ in., ½ in., ¾ in.
- f) Square point, ¼ in., ½ in., ¾ in.
- g) Turning chisels, ¼ in., ½ in., ¾ in.
- h) Turning gouges, ¼ in., ½ in., ¾ in.
- i) Turning skews, L.H., ¼ in., ½ in., ¾ in.
- k) Turning skews, R.H., ¼ in., ½ in.

VISE — 3-in. jaw, anvil face

WRENCHES
- a) Adjustable, 8, 10, and 12 in.
- b) Headless setscrew
- c) Pipe, 10 in. and 12 in.
- d) S type or open-end type to fit ⅛-in. to 1-in. N.C. nuts

(Continued on page 52A)

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HARDWARE • HAND TOOLS • ELECTRIC TOOLS • STEEL STRAPPING

(Continued from page 42A)

3–8 to 1–4 large and then all trimmed on 2 sides with one cut for each side. This will result in all finished sheets being the same size.

Dead Jobs: When a learner completes a job he should wash and remove the form from the chase immediately and place it in his galley, hold for a day or two, then distribute. Empty chases allow others to lock up their jobs. Don't wait for the foreman to remind you to unlock and remove your form from the chase.

Turn Off Lights: If you are not using the lights turn them off. This request applies to all, with particular reference to make-up men and vertical pressmen. We have many lights to make our work easier. It is expensive to burn them — but a waste to burn them when they are not being used. Turn them off.

Follow Instructions: Follow instructions in all cases. The way of doing a job in this plant is the same as that used by journeymen in other plants. If there were better ways, these journeymen would have discovered them long ago. Think it over before you try a *short cut.*

It is an old saying that anyone who cannot learn to take and follow instructions will never be able to give them.

Spare Time: There never was a time in a printing plant when there was nothing to do. No foreman in any plant will allow any journeyman to loaf, loiter, talk to other workers, indulge in "horseplay," use tools and material and then leave them for someone else to clean up, and otherwise interfere with the operation of the plant. Neither will this conduct be countenanced in this plant.

Clean, Careful, Workmanship: Clean and put away tools and equipment, clean and replace lids on cans, replace corks in bottles, watch for screws and parts of machines that may fall on the floor, report immediately any machine that is out of order or any part missing, or broken. Do your part to keep this plant clean, orderly, and in good operating condition at all times. By co-operating freely and willingly you are training yourself for journeymanship and a foreman's job. Be a *better* journeyman — "Hitch Your Wagon to a Star."

Foreman's Desk: Rummaging through the foreman's desk or through the papers on top, without his permission, is considered an act of great discourtesy and lack of consideration for the property of others, and might lead to a suspicion of theft. Don't move or touch anything on this desk.

Visitors: When a visitor comes into this plant the learner nearest him should politely ask if he can be of any assistance. Then direct the visitor to the foreman. If the foreman is out, invite the visitor to have a seat, and assure him that the foreman will return in just a few minutes. Under no circumstances should a learner accept a job of printing, or make any promises about printing jobs, or give any decisions on general policy. This is the foreman's business. It is always safe to refer *all* customers to the foreman.

Vertical Pressmen — Duties:

a) Keep the press and gun *clean* and *oiled.* Eighty per cent of all machine trouble may be traced to dirt and a lack of oil; 10 per cent to neglect and indifference.

b) Keep floor and pressman's cabinet clean.

c) All rags that are saturated with gas, oil, and ink and cannot be used again should be placed in the wastebasket for the custodian to remove when he sweeps up. All other rags should be kept in the metal container — not on top of a table or on the floor. An experiment proved that an oily rag in a closed room for three hours started a fire. Let's be careful.

d) Keep the rollers down when not in use. Check their adjustments for height once every two weeks. Check the delivery grippers occasionally for correct "bite."

e) Get instructions from foreman before installing perforator.

f) Always have plenty of packing paper of proper size cut and ready for use.

g) Develop a habit of checking the stock after it is placed on the elevator so that it will not be printed "tail up" instead of "head up."

h) In rush times volunteer to help while waiting for forms; cut stock, lock up forms, clean up, etc.

i) No walking around, looking or talking to others who are busy. Read everything you can find in the plant and school libraries on presses and presswork. Remember — if you are to become a journeyman *you* are the one who *must* put out the energy and study. No one can do it for you.

Make-up Men. — Duties:

a) Keep the stone, the drawer beneath, and the shelves clean. Keep the leads, slugs, reglets, quoins, furniture where they belong.

b) Keep the dump clean and in order. Gal-

(Continued on page 54A)

The Sensationally NEW Low-Priced
PARKS No. 20
20" PLANER
Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for every shop and industrial plant requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds — 20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.
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(Continued from page 50A)

Woodworking—Materials and Supplies

ALCOHOL

BENZINE

BRADS — 3/8 in., 1/2 in., and 5/8 in. No. 20; 3/4 in. and 7/8 in. No. 19; 1 in. No. 18; 1 1/4 in. and 1 1/2 in. No. 16; 1 3/4 in. No. 15; 2 in. and 2 1/2 in. No. 14

CARBON PAPER — black

COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermilion

COLORS — ground, in oil or japan: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermilion

DECALCOMANIA TRANSFERS

DOWEL PINS AND PLATES

DOWELS: hardwood, 3-ft. lengths, 1/4 in., 5/16 in., 3/8 in., 1/2 in., 3/4 in.

ENAMEL
- a) Selected colors
- b) Undercoater

FILLERS — paste: natural, golden oak, dark oak, and mahogany

FILLETS — leather, 1/4 in. and 1/2 in.

GLUE
- a) Casein, hide, best grade cabinet
- b) Liquid

HARDWARE: Brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
- a) And eyes
- b) Cup
- c) Screw and
- d) Square screw

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine

In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking

Hardwood, for furniture, should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
- a) Common, 6d, 8d, and 10d
- b) Flathead, 1/2 in. No. 20, 3/4 in. No. 19, 1 in. No. 18, 1 1/4 in. and 1 1/2 in. No. 16, and 2 in. No. 14
- c) Finishing, 4d, 6d, and 8d

OIL
- a) Linseed, boiled
- b) Linseed, raw
- c) Machine
- d) Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, 1/2, 1
Garnet finishing paper, 6/0, 4/0
Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
- a) Flathead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 5 by 5/8 in., No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in.
- b) Flathead, bright, No. 3 by 1/2 in., No. 4 by 1/2 in., No. 6 by 3/4 in., No. 7 by 7 3/4 in., No. 8 by 1 in., No. 10 by 1 in., No. 8 by 1 1/4 in., No. 10 by 1 1/4 in., No. 14 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in., No. 10 by 1 3/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in., No 12 by 2 in., No. 14 by 2 in., No. 12 by 2 1/4 in., No. 14 by 2 1/4 in., No. 14 by 2 1/2 in
- c) Oval head, brass, No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., and No. 10 by 1 1/4 in.
- d) Roundhead, blued, No. 3 by 3/8 in., No. 3 by 1/2 in., No. 5 by 3/4 in., No. 6 by 3/4 in No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in.
- e) Roundhead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 4 by 5/8 in., No. 5 by 3/4 in.

SHELLAC
- a) Orange, cut 4 lb. to the gal.
- b) Sticks, assorted colors
- c) White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers

STAINS — oil, spirit or water Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut

STEEL WOOL — No. 0 and No. 2/0

TURPENTINE

TWINE

VARNISH — coach, flat, rubbing, spar, and rubbing

WASTE — cotton, white

WAX — bees and finishing

WHITE LEAD

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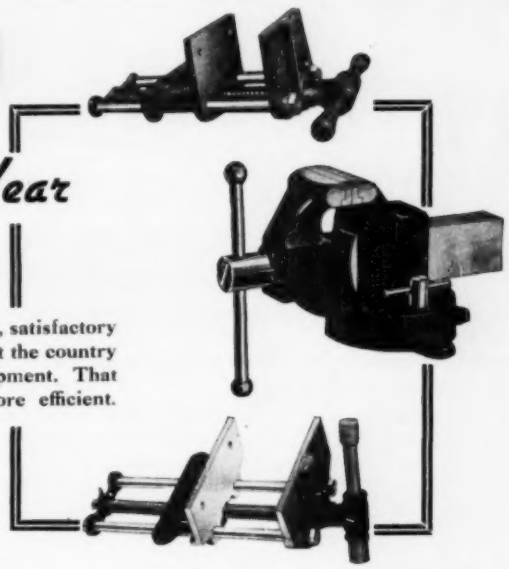
Morgan semi-steel vises give you more years of unbroken, satisfactory service. That is why thousands of school shops throughout the country are using Morgan vises as standard industrial-arts equipment. That is why, too, their shops are more economical and more efficient.



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Automatic Saw Filing trains your students . . . Doubles Life of Saws

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—Samuel Gompers Trades School, San Francisco

FOLEY SAW FILER

Makes Old Saws . . .

Turn Out Like New!

TYPICAL SCHOOL USERS

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Charleroi School District, Charleroi, Pa.
Redlands Public Schools, Redlands, Calif.
Stout Institute, Menomonie, Wis.

THE FOLEY is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster truer, cleaner – stay sharp longer.

With a Foley Automatic Saw Filer you can sharpen your saws more perfectly than is possible by hand. You can do it quicker – and your saws will stay sharp longer. Your students will turn out better work with sharp saws. ALSO by keeping your saws sharp with a Foley – you will easily double their cutting life and have less breakage, reducing replacements to a minimum.

30-DAY TRIAL OFFER. You may have the privilege of using a Foley Saw Filer in your own shop for 30 days – and see for yourself its training advantages and operating economies. Send coupon for details.

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Please send literature on the Foley Automatic Saw Filer and details of your 30-Day Trial.

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Supply your woodworking students with Paxton lumber and plywood and assure them first quality materials. Their projects will acquire added beauty and durability when made of Paxton products. As a result, the student will derive greater satisfaction from his efforts to create an attractive article out of wood.

Paxton lumber and plywood meet every requirement and have always represented first quality — an important consideration in modern school shops where materials of doubtful quality have never proven an economy.

We are prepared to supply you at all times with lumber and plywood of the highest quality obtainable, measured and graded in the best interpretation of current national grading rules. Our reputation guarantees you the finest in these materials.

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(Continued from page 51A)

ley number and operator's name *must* head each galley of type.

c) Make corrections and check after they have been put in. Hang both proofs on proper nail.

d) Heads must be spaced and put on story, and ads set *before* proofs are pulled. Copy must accompany proof to proofreader.

e) Help operator clean plunger, well, mouthpiece, and bands. Keep floor clean around machine and metal separated in pans as follows — slugs, shavings, and dross.

f) Make-up men are responsible for the condition of the saw; installing sharp saws and trimmers and adjusting to cut accurately. Keep metal pans emptied and the floor clean.

g) Help operators clean, oil, and repair linotype machine.

h) Shift to operating (straight matter only, unless you have permission) when work is light and jobs are "up." The make-up man who watches for these slack periods and who asks to go on the machine will get more linotype experience than one who waits to be told. The habit of checking every time a change is made in the setup of the linotype *must* start here, being sure *before* the line is sent over that the following has been checked twice: (1) mold, (2) ejector, (3) vise jaws, (4) assembler line length, (5) magazine.

i) Put together difficult jobs such as the class schedule each semester.

j) Be careful, be helpful to others when they are rushed, be willing and eager to work and co-operate. You have been selected for this work by the foreman because he felt that you had the ability to learn to be a *good* operator. Whether you do is up to you. You'll never have another chance like this one.

k) In spare time read the book: *Linotype Machines.*

Figuring Stock: The cost of all bristol (cardboard) is figured by the large sheet. White, 6 cents per sheet; all colors, 8 cents per sheet. Multiply the number of large sheets required by the cost per sheet.

All book, bond, ledger, and most cover stock is sold by the pound. Multiply the number of large sheets required by twice the ream weight; then point off three places; then multiply by the cost per pound; then point off properly. If the rule is followed carefully, and your figures are checked, the result will be the correct cost of the stock used. This is only one method of figuring stock. There are many others, and any method may be used, if the results are correct.

ELEMENTARY AUTO MECHANICS

FRANK B. MILLER
Central High School
Tulsa, Okla.

(*Continued from page 37 of the January, 1949, issue*)

Assignment Sheet No. 33 — Replacing Piston Assemblies

Why this is done:

After piston assemblies have been cleaned and overhauled, they must be replaced in the motor in their proper position and cylinder.

Procedure:

1. Select a ring compressor of the proper size and kind — Stephens spring skirt type if the piston goes down, or handle and sleeve if it goes up.

2. Remove rod cap and shims from one piston.

3. Turn crankshaft throw for that piston down and to one side.

NOTE: The shaft usually has to be shifted around if the piston is being inserted from below.

4. With the compressor in place on the rings, insert the piston in the cylinder by alternately turning and pushing until the rings are within the cylinder.

NOTE: Do not hammer on the piston as neither cast iron nor aluminum can resist the force of hammer blows.

5. Remove the compressor and bring the rod bearing on top of the crankshaft throw.

6. Place the shims and cap in position and bolt them on, making sure the shims are not twisted.

CAUTION: Be sure the numbers correspond to the cylinder, and that both the piston and the rod cap have their numbers on the camshaft side.

7. Draw the nuts down tight and insert new cotter keys.

CAUTION: If the bolts fail to draw down, check to see that the flat side of the bolt head is against the rod, as otherwise the bolt cannot draw down and would also be sprung if pressure were put on the nut.

8. Repeat for the rest of the pistons, *one at a time.*

(Continued on next page)

(Continued from previous page)

Questions:

1. Why have the crankshaft throw down, when inserting a piston assembly?
2. On what side of the motor should pistons be inserted when putting them in from below? Why?
3. What two things might happen if a piston were forced into the cylinder with a hammer?

Text reference: ....

Assignment Sheet No. 34 — Fitting Connecting Rod Bearings

Why this is done:

For rod bearings to be able to stand up under constant rapid motor action, it is necessary that they be fitted to the crankshaft throw with just enough clearance to permit proper lubrication, but not enough to permit any free play.

Procedure:

1. Loosen all connection rod bearings but one, by several turns of the nuts so that they will not drag on the crankshaft.
2. On the remaining rod bearing, remove shims one at a time, retightening the cap in place each time, until the motor cranks stiffly.
3. Replace one thin shim, which should be enough to permit the motor to crank over fairly easily. If necessary, a second shim may be removed.
4. After determining the correct number of shims for the first rod, loosen that rod bearing and repeat the operations with each other rod, one at a time.
5. After all bearings have been properly shimmed, tighten all of them, and cotter the bolts with new cotter keys.
6. A check of the bearing fit may be made by what is known as the snap fit method, as follows:

A. After the bearing has been drawn up tight, see if it can be moved sideways by hand. If movable by hand, it is too loose.

B. If not movable by hand, tap it sideways with a light tap by an 8-oz. ball-peen hammer, holding your other hand on the crack between the other side of the bearing and the shaft. If not movable, it is too tight.

Questions:

1. What would be the effect by accidentally putting a rod cap on backwards when checking bearing fit?
2. What is the function of the side play of a rod cap on its shaft?
3. What is the most confusing weakness of the first method of testing fit as given in the foregoing.

Text reference: ....

Assignment Sheet No. 35 — Removing and Replacing Crankshafts

Why this is done:

For inspection of the upper half of the main bearings and other work on the crankcase, it is necessary to remove the crankshaft.

Procedure:

1. Check to see that the main bearing caps are marked and all on the camshaft side.

NOTE: If possible, the crankcase should be turned upside down to remove the crankshaft.

2. If necessary, remove flywheel from crankshaft and any flywheel underpan.
3. Remove main bearing caps and take care of any shims so as to return them to the proper places.
4. Lift out the crankshaft and wipe clean.
5. When necessary repairs and inspections have been made, lay crankshaft right end to, in the crankcase bearings.
6. Place shims and caps in place and draw down bearing bolts tightly, inserting new cotter keys.

Questions:

1. If the motor is upright, what danger must be guarded against in removing a crankshaft?
2. What method can you suggest for care of shims when the crankshaft is out of the motor?
3. Why should main bearing bolts be cottered when the bearings are always stationary?

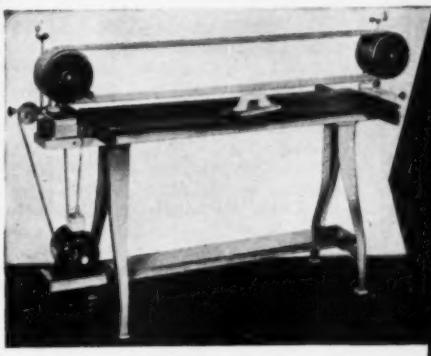
Text reference: ....

Assignment Sheet No. 36 — Fitting Main Bearings

Why this is done:

For proper operation and long life of a crankshaft bearing it must be fitted to the shaft with just enough clearance to permit lubrication, but not enough to permit any free play.

(Continued on next page)



The LOWEST COST, MOST COMPACT, Mill-Type, Hand Stroke BELT Sander-Grinder

BOICE-CRANE NO. 1165
Belt Sander-Surface Grinder

Designed for quick sanding of all woods and polishing and fine surface finishing of industrial materials such as steel, aluminum, brass, copper, plastic, fibre and zinc. Also serves as a drum sander on contours or irregular shapes. In many shops this machine handles 75% to 85% of all sanding, grinding and polishing on flat and contour parts.

The work is always face up, which lessens the danger of taking off too much material and spoiling the part. No time is lost turning the part over to check results. Guesswork is eliminated.

Instant operator control permits anything from light "spot" touch-ups to deep "all-over" cuts. The free rolling of the work table, plus hand stroking, results in a satiny finish surface. This rolling work table furthermore permits handling material up to 36" wide, impossible on any machine without this feature.

Large size needle-bearing-equipped idler pulleys give longer belt life and increased power.

SPECIFICATIONS:

Drums: 10" diameter. 7" wide. Shell Type. Spun Steel.
Work Table: 18" x 60".
Table Fore and Aft Travel: 18".
Abrasive Belts: 6" wide. Cloth Back.
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Position..... Institution.....

(Continued from previous page)

Procedure:

1. Loosen all but one main bearing several turns of the bolts.
2. Add or remove shims one at a time to the remaining bearing until there is a heavy drag on the crankshaft revolved by hand.
3. Add one .002-in. shim and bearing is adjusted.

NOTE: The number of shims on each side should be as equal as possible.

4. Loosen the bearings just adjusted and repeat the operations for the rest of the bearings, one at a time.
5. Tighten all bearing caps tightly and cotter the bolts with new cotter keys.

Questions:

1. Why have the rest of the bearings loosened when adjusting one?
2. Why keep the number of shims on each side as equal as possible?
3. Why can the snap fit test be used on rod bearings, but not on main bearings?

Text reference: ....

Assignment Sheet No. 37 — Removing and Replacing Camshaft

Why this is done:

Wherever necessary to inspect and replace camshaft bearings it is necessary to remove the shaft.

Procedure:

1. Remove the timing gear cover plate.
2. Inspect the timing gears to find the timing marks used.
3. Inspect the end of the camshaft to determine what method is used to hold it in place. Sometimes it is a spring and plunger that press against the inside of the cover plate just removed. Sometimes the flange on the front of the camshaft bearing is bolted to the block, or it may be a setscrew in the side of the block.
4. After removing the timing chain, if any, release the camshaft locking device.
5. Make sure that the pressure of the valve lifters is relieved, and remove the camshaft by pulling it out forwards.

NOTE: It may be necessary to start the shaft out by tapping on a block of wood against some cam, but extreme care should be taken to be sure no valve lifter or locking device is holding the shaft in.

6. When the camshaft inspection has been made, insert the shaft through the front bearing and push back in place at the same time, watching to be sure the valve timing marks are lining up.

NOTE: If the camshaft is chain driven, these marks on the two gear rims usually line up with the centers of the two shafts. If gear driven, the two marks usually mesh together.

7. Replace the timing chain, if any, and lock the shaft in place.
8. If the chain driven generator is used, install same and tighten the chain.
9. Replace timing gear cover plate.

Questions:

1. What is the purpose of timing gear marks? What would be the result of replacing

(Continued on page 58A)

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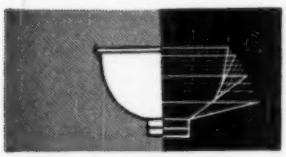

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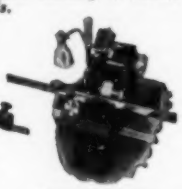

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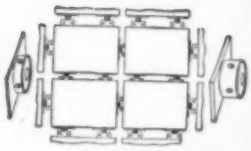
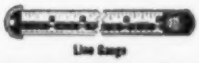


Register Gauges

Newspaper Wall File

Composing Stick



Line Gauge

Make-Up Rule

H. B. ROUSE AND COMPANY
2214 N. Wayne Avenue, Chicago 14, Illinois
"50 YEARS OF SERVICE TO THE PRINTING INDUSTRY"

(Continued from page 56A)

a camshaft without lining up the timing marks?

2. How are the camshaft bearings constructed that the shaft can be drawn through the front bearing even though it has off-center cams?

3. What would happen if the camshaft were not pushed clear back in place?

Text reference: ....

Assignment Sheet No. 38 — Removing and Replacing Flywheel

Why this is done:

For replacing flywheel or renewing the teeth, and for other replacements in the crankshaft group, it is necessary to separate the flywheel from the crankshaft.

Procedure:

1. Remove the flywheel underpan and any other parts necessary to permit the flywheel being removed from the motor.

NOTE: On some motors, the flywheel must be removed *before* the flywheel housing can be removed. In such a case, the clutch assembly and plate must be removed to expose the nuts, and the rear main bearing cap must be removed to expose the heads of the flywheel bolts. The reverse order is necessary on replacing.

2. Check to see if the flywheel and crankshaft flange have corresponding marks of some kind so that the two parts can be replaced in the same relative position. If not, secure instructor's check on marking them.

3. Remove cap screws holding flywheel to crankshaft flange and drop flywheel out of motor.

NOTE: Where possible, it is more convenient to place the motor upside down for removing the flywheel.

4. After the flywheel has been reconditioned, rebolt it to the crankshaft flange, making sure the marks are lined up.

5. Replace cotter keys in bolt heads.

6. Replace underpan and other parts previously removed.

Questions:

1. What is likely to happen if no provision is made for supporting flywheel when removing it?

2. Why must a flywheel be replaced in the same position on the crankshaft flange?

Text reference: ....

(To be continued)

Teaching progress proposes to interpret the philosophy of the American public school and to increase the experiences of the Milwaukee educational program. — *From Teaching Progress, Milwaukee Public Schools.*

NEWS NOTES

(Continued from page 48A)

of the instructional group, whose aim it is to prepare leaders in this field. The first semester deals with basic principles and practices of teacher education; the second semester deals with specific problems in the field.

♦ Nine school districts adjacent to Philadelphia are participating in the Suburban School Study Council, which is under the leadership of the Educational Service Bureau, School of Education, University of Pennsylvania. Members of the faculty of the Department of Education serve as co-ordinators of special committees composed of representatives of the nine suburban schools. These committees were created to consider educational problems of mutual interest. The Educational Service Bureau conducts research projects for the schools, and furnishes them with reports which present the results of various analyses.

♦ An 18-page Teaching Aids Catalogue was announced recently by the School Service Department of the Westinghouse Electric Corporation. It describes numerous charts, posters, and booklets which are available for distribution to high school teachers.

These teaching aids are of great value in bridging the gap between the textbook and the student's keen interest in current developments. Covering a wide range of subjects (nuclear physics, science, homemaking, education, agriculture, industrial arts, and radio), the materials described in the catalogue can be obtained free of charge or for a nominal sum. Each catalogue contains order blanks for use in requesting these materials.

Teachers can secure copies of the Teaching Aids Catalogue through the School Service Department, Westinghouse Electric Corporation, 306 Fourth Avenue, Box 1017, Pittsburgh 30, Pa.

♦ The Bureau of Labor Statistics has recently issued a report, "The Performance of Physically Impaired Workers in Manufacturing Industries," which discusses these questions. The report, based on industry records, analyzes the work perform-

(Continued on next page)

(Continued from previous page)

ance of about 11,000 impaired workers compared to that of 18,000 matched unimpaired workers who were subject to the same job incentives and exposed to the same job hazards.

The general conclusion reached was that physical impairment did not have an adverse effect on either the quantity of the work produced or the quality of work performance. No matter how different physically impaired workers may be in other respects, on the job they were just another group of workers able to meet their unimpaired fellow workers on an equal footing. The need for proper placement for both unimpaired and impaired workers is emphasized.

The report, Bulletin No. 923 of the Bureau of Labor Statistics, may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 55 cents per copy.

♦ The National Board of Fire Underwriters has approved aluminum for use in the installation of ducts for air conditioning, warm air heating, air cooling, and ventilating systems. The approval has been granted on the recommendation from the Committee on Air Conditioning of The National Fire Prevention Association. The Committee's recommendation is based on a careful study of aluminum's satisfactory performance in a large number of duct work applications.

The 1948 edition of NBFU Pamphlet Number 90 will be issued soon and will contain the revision to include standards for ducts constructed of aluminum. The standards will cover installation for residences as well as for industrial buildings. Copies of the standards may be obtained from National Board of Fire Underwriters Offices at 85 John Street, New York 7, N. Y.; 222 West Adams Street, Chicago 6, Ill.; or Merchants Exchange Building, San Francisco 4, Calif.

♦ A vocational school was recently organized at Thiensville, Wis. Classes will be started in agriculture, sewing and knitting, home decorating, woodworking, typing, bookkeeping, and income tax. Classes will be held nights at the Thiensville graded school and village hall. Thiensville is the smallest community to have a vocational school in Wisconsin.

♦ A new educational motion picture, "Craftsmanship in Clay: Simple Slab Methods," has been produced at Indiana University. It is the first in a series of 16mm. sound, color films in the field of ceramics. The second, which deals with methods of applying glaze, will be released in April.

The film shows an expert potter, working in a ceramic studio setting, demonstrating simple methods of making slab pieces. As he works, his tools are introduced and their proper use explained. A carefully paced narration adds to the effectiveness of the film.

Prints of "Simple Slab Methods" can be purchased from the following sources: Educational Film Library Association, Inc., Suite 1000, 1600 Broadway, New York 19, N. Y., or Audio-Visual Center, Indiana University, Bloomington, Ind.

For rental, write to your own film library or the Audio-Visual Center, Indiana University, Bloomington, Ind.

♦ The Indiana Apprentice Curriculum Committee has developed a number of instructor's manuals to be used as a suggested program of related instruction for apprenticeship training. To date, this committee has compiled some twenty manuals covering the particular trades in which such manuals were most critically needed. At the present time the activities of this committee are being carried on in the Trade and Industrial Education Department of Purdue University, and the committee is jointly sponsored by Purdue and the Department of Trade and Industrial Education of the state of Indiana.

The committee has increased its activities and is now able to place these manuals at the disposal of anyone making their request known to the committee. A fee of 75 cents per manual has been established to cover the cost of reproduction. All correspondence should be directed to: The Indiana Apprentice Curriculum Committee, Prof. Ammon Swope, secretary, Room 209, Education Building, Purdue University, Lafayette, Ind.

♦ The New York State School of Industrial and Labor Relations at Cornell University has recently published a 58-page bulletin of interest to training directors.

"Developing Understanding of Basic Industrial Economics" is a review of the second annual plant training directors conference sponsored by the Cornell Industrial and Labor Relations School in July, 1948. The pamphlet contains reports on training programs in industrial economics by Allen B. Gates, director of training at Eastman Kodak Company; by William Machaver, assistant training director of Johnson and Johnson; by Daniel Rochford, management-employee communications adviser of The Standard Oil Company (New Jersey); by Earl H. Weigle, assistant to the president of the Bell Telephone Company of Pennsylvania; by I. Dent Jenkins, general personnel manager of the Harrison Radiator Division of the General Motors Corporation.

The pamphlet is free of charge and may be obtained on request by writing to The New York State School of Industrial and Labor Relations, Cornell University, Ithaca, N. Y.

♦ That 1948 witnessed an increase of 18,200 apprentices employed in the construction industry, a gain of 16 per cent — reaching a record high of 133,250 — was announced recently by William F. Patterson, director, Bureau of Apprenticeship, U. S. Department of Labor, at the graduation ceremony of apprentices in the electrical industry in New York City.

William Machaver, assistant training director of Johnson and Johnson; by Daniel Rochford, management-employee communications adviser of The Standard Oil Company (New Jersey); by Earl H. Weigle, assistant to the president of the Bell Telephone Company of Pennsylvania; by I. Dent Jenkins, general personnel manager of the Harrison Radiator Division of the General Motors Corporation.

The graduation ceremony was held by the Vocational and Apprenticeship Committee of the Joint Management-Labor Industry Committee of the Electrical Industry, which is in charge of the area-wide apprentice-training program in this industry in New York City.

(Continued on next page)

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20-J	20-24 pupils	1030
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6-S	6-10 pupils	598
11-S	12-15 pupils	910
15-S	15-20 pupils	1040
20-S	20-25 pupils	1248
Vocational		
10-V	10-20 pupils	2240
10-VO	10 pupils (Complete Offset Dept.)	1152
20-V	20-25 pupils	2968
Teachers College		
20-TC	15-25 students	1430

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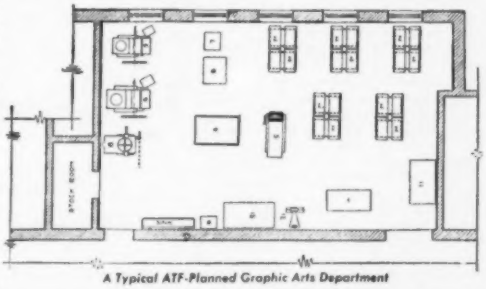

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Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BELLOWS
- a) Hand, small size
- b) Electric, blower type

BLACKBOARD — permanent or portable

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
- a) Bench
- b) Benzine, No. 1, oval black
- c) Floor
- d) Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
- a) Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
- b) Galley, for 8¾ in. by 13 in. galleys, wood or steel, four tiers
- c) Ink and roller, to accommodate platen-press rollers, wood or steel
- d) Matrix, for use with typesetting machines only
- e) Roller, cabinet or rack for cylinder rollers
- f) Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
- g) Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copyholder
- h) Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
- i) Type, complete with 24 full-size California job cases, double work band, wood or steel
- k) Wood or metal, for filing class records, instruction sheets, etc.
- l) Storage for cuts

CANS
- a) Benzine, pint size
- b) Benzine, 5-gal. size
- c) Kerosene, safety, 1-gal. size
- d) Waste can, fireproof, for rags

CASES
- a) Blank, full-size, to accommodate ¼-size cases
- b) Border, ¼ size, for ornamental borders
- c) Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
- d) Metal furniture, to hold laborsaving fonts
- e) Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHASE RACKS
- a) For platen presses
- b) For cylinder presses

CHASES
- a) For each size of platen press
- b) For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
- a) Lead and rule
- b) Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
- c) Paper, lever type, 26 in. or 30 in.
- d) Paper, lever type, 30 in., with divided back gauge
- e) 30 in. to 36 in. power cutter

DESK
- a) Bindery, 80 by 36 in.
- b) Drying rack
- c) Imposing, 51 by 39
- d) Make-ready, 32 by 24 in.
- e) Paper cutters, 80 by 36 in.
- f) Proofreaders
- g) Teachers

DRYING RACKS
- a) Combination drying rack and stock table for platen presses, 30 trays
- b) Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¾ by 13 in., 6¼ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
- a) 12 by 18 in., with iron top, including reglets and furniture
- b) 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- c) 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- d) 39 by 63 in., with iron top, complete drawers, letter boards, reglets, and furniture

INK FOUNTAINS
- a) Short, for 8 by 12, 10 by 15, and 12 by 18 presses
- b) Long, for 10 by 15, and 12 by 18 presses

KNIVES
- a) Overlay, for make ready
- b) Ink, 6 in. and 8 in.
- c) Ink, 8 in., square end

LEADER BOXES

LEADERS
- a) 6, 8, and 10 pt., fine dot
- b) 8 and 10 pt., hyphen

LINE GAUGES
- a) Metal, brass, or steel
- b) Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
- a) For use on presses
- b) Hand machines

ORNAMENTS
- a) Assorted floral and decorative designs
- b) Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
- a) 24 in., foot treadle
- b) 28 in., foot treadle

PLANER
- a) Mallets, hickory or fiber
- b) Proof, maple, with felt bottom
- c) Type, maple, with leather top

PRESSES
- a) Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
- b) Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
- c) Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
- d) Platen, 12 by 18, complete with variable-speed motors, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
- e) Proof, 14 by 18, with cabinet
- f) Proof, 20 by 24, with cabinet
- g) Proof, 23 by 24½ with cabinet
- h) Tableting

PUNCH
- a) Foot power, multiple with assorted punches
- b) Lever, two die, with assorted punches
- c) Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
- a) Sizes No. 1 and No. 2
- b) Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
- a) 2 pt., laborsaving, hair line, side face
- b) 2 pt., laborsaving, 1 pt. side face
- c) 1 pt., laborsaving, 1 pt. face
- d) 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
- a) Iron furniture, as selected
- b) Leads, laborsaving, 2 pt.
- c) Leads, 2-ft. strips, 2 pt.
- d) Slugs, laborsaving, 6 pt.
- e) Slugs, 2-ft. strips, 6 pt.
- f) Spaces and quads
- g) Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ in. or ¾ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
- a) 18 in.
- b) 38 in., upright, to be used with cylinder press only

TYPE
- a) Body, lightface — 8 and 10 pt
- b) Job, lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
- c) Job, lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
- d) Job, boldface — 6 and 8 pt.; 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
- e) Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
- f) Job, condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
- g) Job, text type — 10, 12, 14, 18, and 24 pt.
- h) Job, typewriter type — 12 pt. with spaces
- i) Job, boldface italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
- k) Job, heavy copperplate Gothic

(Continued on page 62A)

(Continued from previous page)

♦ Full-size Easi-Bild patterns for constructing toys, bookcases, corner cabinets, chairs, tables, boats, benches, outdoor fireplaces, garden furniture, birdhouses, 2-bedroom house, country cottage, and garage, can be obtained by writing to the Casco Pattern Department, P.O. Box 215, Pleasantville, N. Y.

The prices for the patterns are very reasonable.

♦ The November, 1948, revised list of "Sources of Free and Low-Cost Materials" may be obtained by writing to the Aviation Education Division A-145, Civil Aeronautics Administration, Washington 25, D. C.

♦ Two evening courses in industrial arts are being offered at the University of Pittsburgh, Pittsburgh, Pa., this year.

Dr. Shriver L. Coover, head of industrial-arts department at California State Teachers College, California, Pa., teaches the graduate courses, which are conducted Monday evenings.

♦ A sum of money was subscribed in 1937 in memory of Miss Coralie N. Kenfield of San Francisco, Calif., a teacher who was known throughout the United States for her high ideals and advanced methods in teaching lip reading. The interest provides a scholarship known as the Coralie Noyes Kenfield Scholarship for Teachers' Training Courses for Teachers of Hard of Hearing Adults. (The scholarship offered in 1949 is $100.) The American Hearing Society is the trustee of the Kenfield Memorial Fund.

Applications will be considered from any prospective *hard of hearing* teacher of lip reading to hard of hearing adults who live in the United States and who can meet the following requirements:

A. Personal characteristics necessary for successful teaching.

B. Ability to read lips as certified upon examination by an approved instructor in lip reading.

C. A bachelor's degree, or 2 years of college work plus 12 semester hours of work in adult education, psychology of the handicapped, voice production and control, sight conservation, social service, or 2 years of successful experience in teaching in public or private schools, plus 12 semester hours of work in adult education, psychology of the handicapped, voice production and control, social service, or kindred subjects.

(Continued on page 66A)

IDEAL SHOP TEXTS

WOODWORKING FOR EVERYBODY

By Shea and Wenger

● **Contents:** The Story of Wood, Shop Equipment, Processes, Joinery, Woodworking Machinery, Wood Finishing, Safety — Plus 46 Projects.

$2.50 472 illustrations 192 pages

HOUSEHOLD MECHANICS

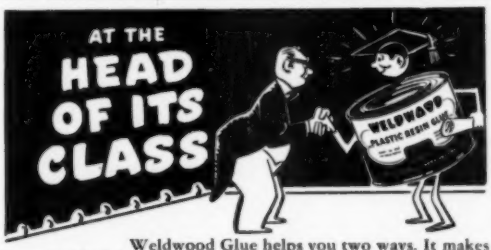
By Bedell and Gardner

● **Contents:** Woodworking, Metalworking, Painting and Finishing, Electrical Appliances, Water Supply and Water Disposal, Care of Doors, Care of Windows, Using Concrete, Mortar and Plaster, Using Rope, The Home Workshop — Plus 148 Projects.

$2.50 642 illustrations 256 pages

INTERNATIONAL TEXTBOOK COMPANY
Dept. 401
SCRANTON 9, PENNA.

SEND FOR 1949 CATALOG



Weldwood Glue helps you two ways. It makes your teaching job easier, and more effective. And it helps your pupils learn faster to do a really professional job of woodworking.

Weldwood Glue mixes quickly with cold tap water. It spreads smoothly and easily. And it sets so fast that jobs can be handled, even light-worked, a few hours after clamping. Result? No waste. No fuss or muss. More time for more projects.

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Weldwood Glue is available in a variety of sizes and prices at your school supply house, hardware store or lumber yard. For full information and sample, mail the coupon.

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Industrial Adhesives Division, Dept. 438,
55 West 44th Street, New York 18, N. Y.

Weldwood

WELDWOOD PLASTIC RESIN GLUE

Please send me literature and free sample of Weldwood Glue.

Name _____ Position _____

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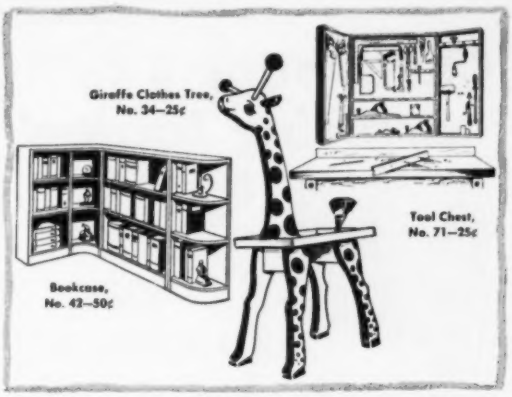
My regular supplier is _____



EASI-BILD* Full-Size Patterns speed manual training 2 ways:

1. **Easi-Bild** makes project selection easier. Folder illustrates over 100 *useful, practical* projects.
2. **Gives student** self confidence because he makes something *quick* and *right* the first time. No blueprint training required.

Plus: the experience in using these famous CASCO industry-tested glues recommended by Easi-Bild.

Cascophen for outdoor projects—boats, sports equipment.

Cascamite for indoor projects—furniture, toys, cabinets.

Cascorez for models, paper projects or where "fast set" is important.

See for yourself. Send coupon below for any of the 3 popular patterns shown above . . . also description of complete pattern service. See how Easi-Bild *simplifies* woodworking.

CASCO Pattern Dept. IV 39, P. O. Box 215, Pleasantville, N. Y.
Enclosed is _____ for patterns checked below.
☐ Bookcase, No. 42–50¢ . . . ☐ Tool Chest, No. 71–25¢
. . . ☐ Giraffe Clothes Tree, No. 34–25¢

Name _____ Title _____

School _____

Address _____

City _____ Zone _____ State _____

THE BORDEN COMPANY • CHEMICAL DIVISION
Makers of Casco Glues

*© 1949, Easi-Bild Pattern Co.

Classroom drafting tables!

LET US KNOW *Your* REQUIREMENTS

Having been enthusiastically approved by industry, Seco 4-post tables are now being offered in classroom size.

Drawers and drawing board storage space are provided in interchangeable units as optional equipment.

Schoolroom installations have been made and proven popular to faculties and students alike.

Investigate advantages of Seco classroom tables. Write to:

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- POWER TOOLS
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Over 1700 Items in Stock for Immediate Delivery

Send for your copy of our big new 14-page price list. It contains full details of our complete stock of plastics and accessories . . . over 1700 items to choose from . . . may quickly solve your problem of where to get the kind of material you need for plastic craft projects. We are equipped to handle your orders promptly, and our mid-continent location enables us to conveniently ship to any part of the country.

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INSTRUCTORS: Accept FREE our big plastics price list, folder on Internal Carving of Plastics, Jewelry Findings Catalog, Information on Fabrication of Plastics — your buying guides for all plastics craft projects. Write on school letterhead stating position. STUDENTS must send 25¢ for this literature which will be deducted from first order.

Plastic Parts & Sales
Dept. S-2039
1157 S. Kingshighway
St. Louis 10, Mo.

(Continued from page 60A)

— 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
l) Wood, condensed Gothic — 8, 12, 15, and 18 line
m) 10 pt. line leaders, 4 dots to the em
n) 10 pt. braces and dashes
o) 10 pt. fractions
p) 10 pt. references
q) Parentheses and brackets
r) 2 pt. laborsaving leads, 4 to 25 picas
s) 6 pt. laborsaving slugs, 4 to 25 picas
t) 2 pt. laborsaving brass rule
u) 2 pt. miters for rule
v) Laborsaving metal furniture
w) Thin spaces with quarter-size case

TYPESETTING MACHINES
a) Either linotype or intertype, 2 or 3 magazines, and molds
b) Matrices for same, 6, 8, 10, and 12 point, as selected

VISUAL AID CHARTS

Print-Shop Supplies

BENZINE OR GASOLINE — for cleaning type or presses

BINDERY TAPE — 2 in. wide, brown or black

GOLD BRONZE — pale

INK
a) Bond, black, for bond papers
b) Book, black, for school papers, etc.
c) Cover, colors as selected
d) Dryers and compounds, as selected
e) Half tone, black
f) Job, colors as selected
g) Metallic, gold and silver
h) Process, black, red, yellow, blue

KEROSINE — for cleaning rollers

PADDING CEMENT
a) Cold
b) Hot

PAPER
a) Bond, fine grade, 17 by 22 — 20, white
b) Bond, medium grade, 17 by 22 — 20, white
c) Bond, sulphite, 17 by 22 — 20, white
d) Bond, sulphite, 17 by 22 — 20, colors as selected
e) Book, enamel, 25 by 38 — 80, white
f) Book, machine finish, 25 by 38 — 80, white
g) Book, eggshell finish, 25 by 38 — 60, white
h) Cover, as selected, 20 by 26, medium
i) Card Bristol, fine grade, 22 by 28 — 4 ply, white
k) Index Bristol, medium grade, 25½ by 30½ — 110, white
l) Index Bristol, medium grade, 25½ by 30½ — 140, white
m) Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
n) Pressboard, red
o) Strawboard, No. 40 or No. 50
p) Tagboard, manila, 24 by 36 — 140
q) Tympan, to fit presses
r) Wrapping paper, size as selected
s) Holder for same

PASTE
a) Bindery
b) Make ready

SILK-SCREEN SUPPLIES consisting of:
a) Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white, and black
b) Solvent profilm in 11- by 14-in sheets
c) 8-in. synthetic squeegee
d) 11-in. synthetic squeegee
e) No-clog varnish
f) Film solvent
g) Stencil filler
h) Filler remover
i) Stencil knife
k) Fiber guides
l) Red sable brush — ½ in.
m) Putty knife
n) Frame tape

TWINE — cotton, for tying jobs

WIRE STITCHING
a) No. 28 round wire for stitcher
b) Wire staples, ¼ in.

Drafting Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

ADJUSTABLE-CURVE RULER

BEAM COMPASS

BENCH BRUSHES

BLACKBOARD
a) Permanent or portable

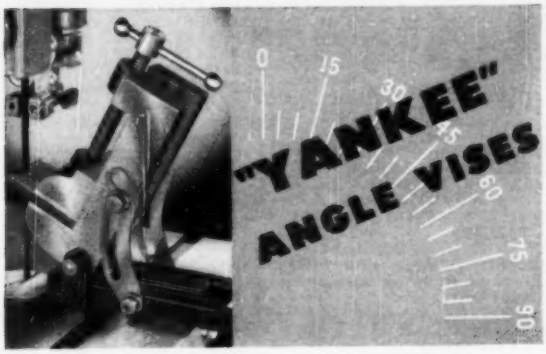
b) Compass, 15 in., with locking device
c) Drawing set: T square, straightedge, triangle, and protractor

BLUEPRINT
a) Frame or machine
b) Washing trays or washer
c) Paper tube, airtight
d) Drying rack or dryer

BOOKCASE

CABINET
a) For filing drawings

(Continued on page 64A)



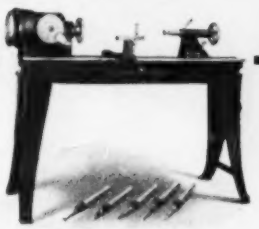
One indispensable tool that multiplies the value of every machine tool in your shop

Angle set-ups for your drill press, shaper, saw and other machines . . . and for bench work . . . without special jigs or fixtures. Simple 1-minute, 2-step operation. Lock the work in a "Yankee" Angle Vise. Adjust for the angle and engage positive adjustment lock. Angle adjustment does not interfere with full capacity of jaw opening. You're set up for every stage of the job, from bench to machine and back to bench. Attaches quickly to swivel base on bench or to table of any machine. Two sizes, 2" and 2¾" jaws, with or without swivel base. Write for Vise Folder and "Yankee" Tool Book.

YANKEE TOOLS NOW PART OF STANLEY THE TOOL BOX OF THE WORLD

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

"OLIVER" METAL SPINNING LATHE



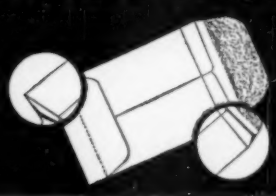
This New Lathe is a "must" for progressive shops . . .

The "Oliver" Metal Spinning Lathe will prove a most helpful addition to your equipment. It swings 12" diameter, 24" between centers. Students learn quickly to spin useful articles of surprising beauty from pewter, aluminum, copper, etc. Its smooth flow of power spins 20-gauge steel with ease. Has heavy bed, extra large bearings, live tail center. Ball bearing motor-driven headstock and adjustable from 800 to 2750 R.P.M. And for turning wood it is unmatched.

Write for Bulletin No. 159-M

OLIVER MACHINERY COMPANY • GRAND RAPIDS 2, MICH.

Know your envelopes . . .



For packaging or payroll!

MANY packaging problems have been solved . . . satisfactorily and economically . . . by using one of the many coin envelope sizes. (Size range: 1 1/16 x 2¼ to 3½ x 6½.)

These useful containers have enveloped a myriad of items from small nuts to lamp cord holders. Various treatments of this type of envelope transforms it into a very inexpensive but necessary and safe container, for mailing, shipping, or handing out small items that are likely to be over-looked.

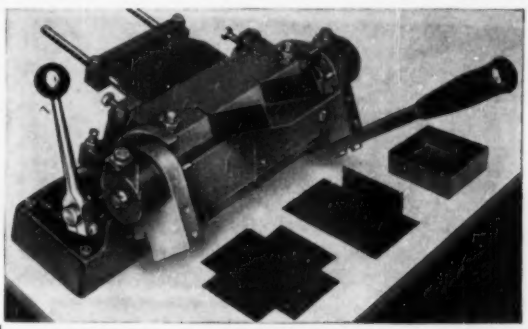
A special "safety-fold" treatment makes an ordinary coin envelope into a sift-proof, solid package body at a nominal expense. This type of container enjoys great popularity with seed or powder men that have free flowing materials to package.

The coin envelope has also found itself in many plants that pay by cash. The sizes can accommodate printed forms for deductions, etc., and provide ample security and protection to the contents.

REMEMBER THE COIN ENVELOPE AND ITS "SAFETY-FOLD" FEATURE FOR PROFITABLE PACKAGING.

WESTERN STATES *Envelope Company*

1616 WEST PIERCE ST. MILWAUKEE 4, WISCONSIN



A BOX FORMING PROJECT
with DI-ACRO BRAKE and DI-ACRO NOTCHER

Here is an interesting and practical student training project which teaches ingenuity in forming methods with modern equipment. Step I. The four corners of the flat material are notched with the DI-ACRO Notcher (not illustrated). Step II. Two sides of the box are formed with the DI-ACRO Brake as shown. Step III. The top forming bar on the brake is slotted to allow the previously formed sides to enter, while last two sides are formed.

Send for **40 PAGE CATALOG**

describing "Die-Less Duplicating" with all six DI-ACRO Precision machines — Benders, Brakes, Shears, Rod Parters, Notchers, Punches — and showing many examples of duplicated parts.

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

351 — 8th AVE., LAKE CITY, MINN.

Sturdy Sjöström Work Benches—

- Ideal for school shops where long life and maximum utility are a "must".
- Attractive heavy duty construction—natural finish maple and birch, with stout 2¼" edge grain tops; tops and bases bolt reinforced.
- Four types—single (52" x 22" x 32") and two student (52" x 36" x 32") types; with or without tool drawers of durable dovetailed construction.
- Equipment for each student—continuous screw vise with ample 4" x 7" jaws, metal bench hook and dog.

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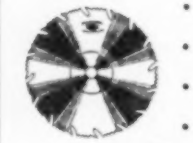

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Founder

Since 1852

. . . SAWS THAT MEET EVERY DEMAND OF THE TRADE.

There's almost a century of experience back of Ohlen-Bishop saws. Wood workers and master carpenters will tell you this wealth of experience shows in every saw produced by our trained workmen.

The Ohlen-Bishop line of carpenter and wood working saws is complete. Every handle and every blade is designed to provide the greatest ease of operation and working efficiency. Choose Ohlen-Bishop and know you're getting a truly good saw.

OHLEN-BISHOP

OHLEN-BISHOP MFG. CO., 1309 Kinnear Rd., Columbus, O.

(Continued from page 62A)

b) For storing drawing boards
c) For storing drawing instruments
d) For storing models

CALIPERS — 6 in. and 8 in., inside and outside
CHAIR — teacher's
DESK — teacher's
DIVIDERS — proportional
DRAFTING MACHINE — and accessories
DRAFTSMAN'S STEEL PROTRACTOR
DRAWING BOARDS — large
DRAWING-BOARD SUPPORTS — to be set on or attached to woodworker's bench
DRAWING TABLES AND STOOLS
a) For students
b) For teachers
INK-BOTTLE HOLDER
IRREGULAR CURVES — Nos. 17, 21, and 24, wood, rubber, or transparent
LETTERING ANGLES
LETTERING PENS — assortment of 12
LEVEL OR TRANSIT — builders' for architectural students
LEVELING ROD — for use with the transit
MACHINISTS' COMBINATION SET — 12 in.
MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETERS
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
TABLE
a) For cutting and trimming drawings and blueprints
b) For disassembling and reassembling machine parts and models
TAPELINE
a) 100 ft., steel, for architectural students
b) 50 ft., steel or metallic
TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
a) 30–60 deg., 14 in. transparent
b) 45 deg., 10 in. transparent
TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing boards
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK

To be provided by, or for, each student

Drafting—Small Equipment

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architects', triangular
SCALE GUARD
SLIDE RULE — 10 in., as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30–60 deg., 10 in. transparent, and 45 deg., 8 in. transparent

Drafting Supplies

BICHROMATE OF POTASH — crystals
BLUEPRINT
a) Paper, 36 in. wide
b) Writing fluid
PAPER
a) Cross section, 8½ by 11 in.
b) Detail, 24 by 36 in.
c) Drawing, 24 by 36 in.
d) Isometric, 7 by 10 in.
e) Tracing, 36 in.
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
a) Fixing salts
b) Paper, 36 in.
c) Writing fluid

Drafting—Additional Supplies

To be provided by, or for, each student

ERASERS
a) Cleaning
b) Ink
c) Pencil
INK
a) Black, waterproof
b) Colored, if required
PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H
PENCIL POINTER PAD
THUMBTACKS OR SCOTCH TAPE

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On everything in latest metal and woodworking machine tools and accessories. We sell nationally known products only. Most of the following items are carried in stock.

- LATHES, metal and wood-working, SEBASTIAN, SHELDON, ETC.
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- SHAPERS, from 7" to 24"
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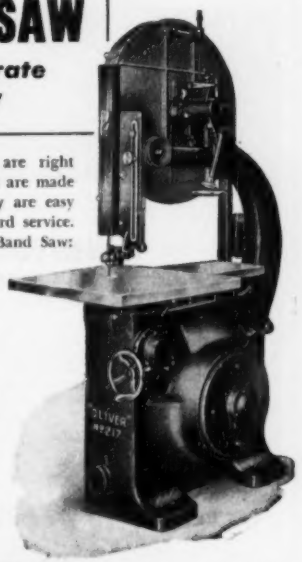
- BAND SAWS, vertical, horizontal
- POWER HACK SAWS
- PORTABLE ELECTRIC DRILLS
- VISES, CHUCKS, DIVIDING HEADS
- INGERSOLL RAND PORTABLE ROTARY IMPACT TOOLS
- BENCH & FLOOR TILT ARBOR SAWS, all sizes
- JOINTERS, JIG SAWS, BAND SAWS, RADIAL SAWS
- SANDERS, all types
- PLANERS, SHAPERS, VISES, woodworking
- MITRE BOXES, ELECTRIC MOTORS
- AIR COMPRESSORS, PAINT SPRAYS
- A.C. WELDING UNITS, ELECTRIC & CHAIN HOISTS
- SHEET METAL CRAFT EQUIPMENT
- PRESSES, arbor, Hydraulic, etc.
- DIESEL POWER GENERATING UNITS 3½ H.P. and up
- FURNACES, FORGES gas & electric
- BEAVER Portable Pipe and Bolt Threading Machines
- HAND TOOLS AND CHESTS
- STEEL SHELVING LOCKERS

Write now for complete information on any items in which you are interested.

GENERAL MACHINERY & EQUIPMENT CO.
140-44 S. 17th Street Harrisburg, Pa.

"OLIVER" 30-INCH BAND SAW

for smooth, accurate work with safety



Industry's favorite Band Saws are right for teaching. "Oliver" Band Saws are made in 18", 30" and 36" sizes. They are easy to operate, and are built for hard service. Note these features of the 30" Band Saw:

- Upper wheel has automatic brake
- Shut-off foot brake for lower wheel
- High-speed disk wheels mounted on ball bearings
- Self-locking table tilts 45° to right and 10° to left
- Efficient dust collecting system
- Heavy one-piece frame
- New frictionless type saw guides

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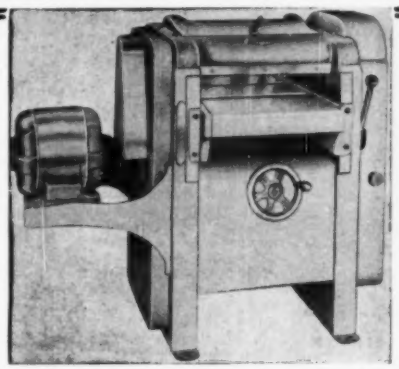
Boring Machines	Shapers
Circular Saws	Speed Lathes
Jointers	Metal Spinning Lathes
Jig Saw	Tool Grinders
Mortisers	Electric Glue Pot
Planers	Wood Trimers
Sanders	

Write for Bulletins

OLIVER MACHINERY COMPANY • GRAND RAPIDS 2, MICH.

TOOL UP WITH WOODWORKER



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PLANER

This heavy duty planer built to give trouble free service for many years. Capacity: ⅛" to 6" in thickness. Two rates of feed: 15 and 30 feet per minute. Completely equipped with safety devices.

Low priced: $671.00 with 3 H.P. single phase motor
620.00 with 3 H.P. three phase motor
635.00 with 5 H.P. three phase motor

Immediate delivery. Write for complete information

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NEW

The Complete Training Book You Have Long Wanted!

TRAINING EMPLOYEES AND MANAGERS

FOR PRODUCTION AND TEAMWORK

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Interested persons may earn a maximum of nine quarter credits per term. The offering will include both manipulative and professional courses, representative of industrial arts, federally-aided vocational-industrial education and vocational guidance. New offices, shops and classrooms will add to the convenience and efficiency of students. Library facilities and recreational programs are unexcelled.

FOR FURTHER INFORMATION WRITE:

To Dean of the Summer Session, 906 Administration Building, for Summer Session Bulletin containing general information and course schedules; for details of degree requirements for B. S. or M. A. (four plans) and Ph. D.; or for Graduate School Bulletin and "Application for Admission" blank, if not filed earlier.

UNIVERSITY OF MINNESOTA

MINNEAPOLIS 14 MINNESOTA

(Continued from page 60A)

D. Professional training in lip reading distributed as follows: 30 clock hours of private instruction under an approved teacher of lip reading, or 60 clock hours of instruction in public school classes under an approved teacher of lip reading.

The winner of the scholarship may take the normal course from any normal training teacher or school or university in the United States offering a course acceptable to the Teachers' Committee of the American Hearing Society.

The applicant for the scholarship must be a prospective teacher. Applications from those who are teaching lip reading now cannot be considered. The scholarship must be used within one year from the granting of the award.

Applications must be filed between March 1, 1949, and May 1, 1949, with Miss Rose V. Feilbach, Teachers Committee, American Hearing Society, 817 — 14th St., N.W., Washington 5, D. C.

♦ Experimental television classrooms will be in operation when the navy starts sending trial television programs from its Sands Point, Long Island, television station to a class of trainees at the same location.

Weekly schedules of lectures will be telecast four miles to large-screen General Electric receivers at the Merchant Marine Academy at Kings Point, N. Y. Results for television classes will be compared with those receiving standard instruction.

Installation of the G-E equipment at the Sands Point Naval station was made by navy and General Electric television engineers.

♦ Twenty-one fellowships are offered students wishing to qualify for the master of forestry, master of science, and doctor of philosophy degrees, by the New York State College of Forestry at Syracuse University, Syracuse, N. Y.

These fellowships carry stipends of $585 to $1,450 for a 9 months' period. Recipients may specialize in forest botany, forest entomology, forest zoology, wildlife management, silviculture, forest management, forest administration, photogrammetry applied to forestry, landscape and recreational management, wood technology, forest products manufacture and utilization, pulp and paper manufacture, and wood chemistry and plastics.

Holders of these fellowships are excused from paying college tuition and laboratory fees normally amounting to approximately $360 per year. Recipients are required to assist in teaching and research work for a maximum of not to exceed 15 hours per week.

Applications should be made by June 1 to Dr. Shirley, New York State College of Forestry, Syracuse 10, N. Y.

♦ General Motors Institute, Flint, Mich., announces the 1949 sessions of the auto mechanics teacher training program for college and high school teachers of automotive subjects. There will be two sections: June 27 to July 23, and July 25 to August 20, 1949.

Tuition for the entire course will be $40. If advantage is taken of arrangements that can be made for board through the Institute's cafeteria and lists of rooms furnished by the Institute, it is possible for the teacher to board and room for approximately $20 per week.

♦ Any student in grades 7, 8, 9, 10, 11, and 12, enrolled in shop or drawing courses in a public, private, or parochial school in the United States is eligible to enter the Industrial Arts Awards Fair. Students graduated in January or February, 1949, may participate if the work entered was completed prior to graduation. There is no entry fee. The deadline date for shipping entries is June 20, 1949. Entries should not be shipped before May 20, 1949. Entries will be returned to the schools from which they came, and will be sent express collect in care of the principal. It is probable that entries will not be returned before November 1, 1949. For instructions and sample entry form, write to George H. Fern, editor and director, Scholastic Industrial Arts Awards, Scholastic Magazines, 7 E. 12th St., New York 3, N. Y.

♦ Veterans enrolled under the G. I. Bill in on-the-job training courses or in schools below the college level who desire leave of absence, should apply for it at their training establishment or school, and not at Veterans Administration.

Advance leave is provided only in cases of emergency, such as the veteran's illness, illness in his immediate family, or any other compelling condition beyond his control — when denial of leave would result in undue hardship.

Leave is accrued at the rate of two and one-half days a month throughout training — including that time during which the veteran is on approved leave of absence. However, it may not be accrued beyond 30 days.

Veterans training on-the-job or in below-college-level courses under Public Law 16 (for the disabled) must continue to apply for leave at VA.

New Publications

Simulated Stained Glass for Amateurs

By Ruth Case Almy. Cloth, 140 pp., plus 3 inserts, 6⅛ by 9⅛ in., illus., $3.50. Harper & Brothers, New York City.

This book shows the beginner what skills the glazers, who make stained glass windows, must possess.

It also shows how the amateur may learn to simulate stained glass windows, and what materials are needed to follow the new Frengosi method developed which permits the reproducing of the form and color of ecclesiastical windows with substitute materials.

Creative Art Crafts — Book 3

By Pedro deLemos. Cloth, 88 pp., 9 by 12 in., illus., $4.75. The Davis Press, Inc., Worcester, Mass.

This book completes a series of three books on related craft subjects by the same author. The three main sections of the book are: weaving and textiles; pottery and cement craft; puppetry and stagecraft. The weaving and textiles section illustrates the step-by-step methods for raffia, splint, and basketry weaving.

The pottery and cement craft section gives many design ideas and step-by-step instructions for making and firing such popular items as fireplace tiles, Indian pottery, color cement flagstones, sculptured animal forms, and mosaic tiles. There also are directions on how to make a simple kiln for home use.

The puppetry and stagecraft section presents details for making puppets, puppet stages, shadow plays, and wigs and masks. It also describes and illustrates pageantry and costuming for many varieties of plays.

In addition to the three main sections, the author has included a few pages on making novelty jewelry, and sandtable projects.

Related Mathematics Series

Paper cover, spiral binding, 7¾ by 10¼ in. Delmar Publishers, Inc., Albany, N. Y.

Mathematics for Carpentry Trades, 115 pp., $1.40.

Mathematics for Masonry Trades, 74 pp., $1.25.

Mathematics for Plumbing Trades, 101 pp., $1.30.

Mathematics for Electrical Trades, 88 pp., $1.25.

Mathematics for Painting Trades, 67 pp., $1.25.

Mathematics for Automobile Trades, 97 pp., $1.25.

These books on related mathematics present the basic mathematical principles and concepts which the apprentices and mechanics in the various trades must understand and apply as part of their everyday work.

Each of the books is divided into a given number of blocks, and each book also presents a number of tests.

The books are all illustrated with line drawings.

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For more information or bulletins write:

DIRECTOR OF THE SUMMER SESSION

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Department of
INDUSTRIAL EDUCATION

1949 Summer Session June 27 — August 6

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For further information and catalog address:
Director of Summer Sessions
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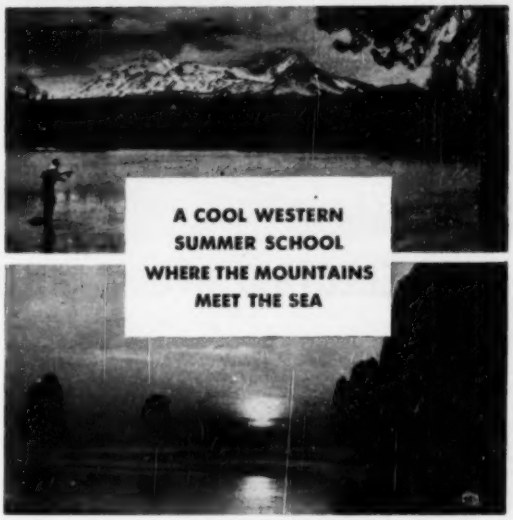
THE PENNSYLVANIA STATE COLLEGE
State College, Pennsylvania

OREGON STATE COLLEGE

SUMMER SESSION • JUNE 20-AUGUST 12



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GRADUATE AND UNDERGRADUATE work in Industrial Arts Teacher Education at a widely recognized school in a splendid physical plant and with a strong staff of resident and guest professors.

Courses include Drafting; Freehand Drawing and Design; Elementary and Advanced Woodwork; Wood Turning; Carpentry and Building Construction; Wood and Metal Finishing; Furniture Design and Construction; Recreational Handcrafts (embracing the *newer materials for shop teachers and directors of "club" work);* Machine Tool Practices; Machine and Tool Maintenance; Forging; Gas and Electric Welding; Ornamental Iron Work; Foundry and Metal Casting; Sheet Metal; Metal-Craft; Metal Spinning.

Special Teaching Methods; History of Manual and Industrial Education; Driver Education and Training (lectures and laboratory *instruction for the training of high school teachers in the techniques of driver education, sponsored by the American Automobile Association and the Oregon Motor Vehicle Division);* Shop Planning and Organization; Written and Graphic Teaching Aids; Trade and Occupational Analysis; Guidance and Counseling; Seminars, Work-Shop Conferences, Special Studies, and Graduate Thesis. Also full programs in Education, Science, Home Economics and general subjects.

The student may plan a program which will lead through successive summers to the bachelor's or master's degree. Approved programs carrying the recommendation of Oregon State College are accepted by all state departments of education for either a SPECIAL or a GENERAL SECONDARY Credential.

For Summer Session Bulletin and details:

Address: Director of Summer Sessions, Dept. V

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CORVALLIS, OREGON

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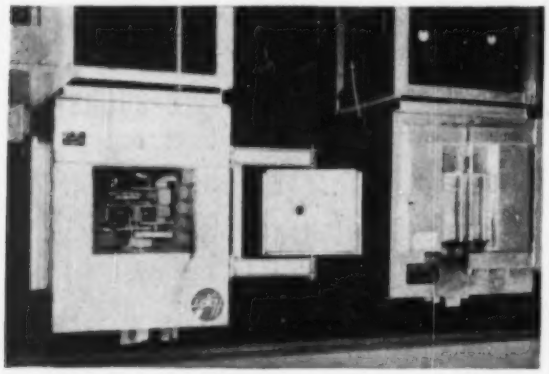

ELECTRIC STUDIO KILNS

for the

Advancement of Ceramic Art

IN SCHOOLS • UNIVERSITIES • ADULT EDUCATION PROGRAMS

The above photograph pictures two Harper High Temperature Studio Kilns installed at the Whitney Avenue Adult Arts and Craft's Center, Niagara Falls, New York. On the left is a side-fired model SK-101215-SP; on the right is an over-under-fired model SK-151416. The kilns are fired alternately with the same transformer control which can be seen under the lefthand kiln. This kiln installation provides maximum firing space at minimum equipment cost.

Mr. Weldon R. Oliver, Director of Adult Education, in Niagara Falls says: "The experience of our adult education instructors and students in Ceramics in working with our Harper kilns has been highly satisfactory and pleasant. The use of such excellent equipment has contributed much to the interest shown toward our 5 large pottery classes." *Write for Bulletin 1246.*

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Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

SOUTH BEND BALL BEARING LIVE CENTER

This precision live center has been designed for heavy roughing cuts, but has the accuracy for fine work and high speeds as well. The revolving center is made of electric furnace tool steel heat-treated to a hardness of 61 to 65 Rockwell C. The center point shaft extends through the taper shank and is supported by bearings at both ends. A specially designed precision ball bearing carries both radial and thrust loads, and center point whip is eliminated by a rear pilot bearing. All parts are interchangeable and replaceable.

The center is made in two sizes; the smaller having a No. 2 Morse taper shank and the larger a No. 3 Morse taper shank. For further information write to the South Bend Lathe Works, 178 East Madison St., South Bend 22, Ind.

This firm has just published a catalog describing its complete line of South Bend 9-, 10-, 13-, 14½-, 16-, and 16/24-in. swing precision quick change gear and toolroom lathes, and ½- and 1-in. collet capacity turret lathes are described in a new 64-page general catalog No. 100-G.

Full color illustrations and lathe specifications are shown in the first 55 pages. Eight pages are devoted to illustrations and descriptions of major lathe attachments and accessories, and the last page illustrates and describes the new South Bend precision drill press. Drawings showing required floor space for the various sizes of South Bend precision lathes appear on the inside back cover.

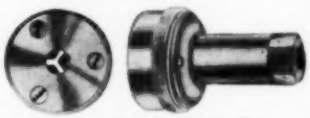
For brief reference use IAVE—0301.

A NEW STUD PULLER BY SNAP-ON

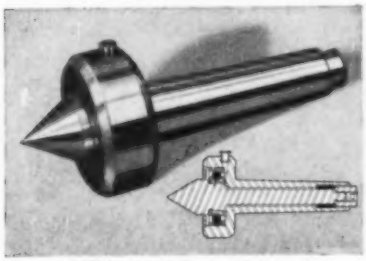
A new design stud puller with a capacity of ¼ to ½ in., which requires no collets, wedges, or other parts to adjust it to different sizes of studs in its size range, has been put on the market by Snap-on Tools Corporation, Kenosha, Wis.

To operate this efficient stud puller, turn the knurled collar to "in" for replacing or "out" for removing, and slip over the stud. Then insert a ½-in. square drive handle and pull. The three jaws automatically close to stud size and grip when pressure is applied. The harder you pull,

(Continued on page 72A)



Snap-on Tool's stud puller



Ball bearing live center

Snap-On display board

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1949 Summer Session
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HOUSING is available on the campus in the new student center, which provides attracive living accommodations and recreational facilities at moderate cost.

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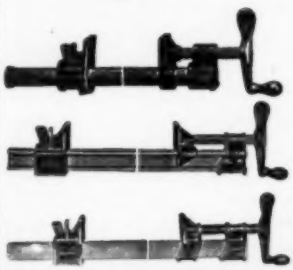

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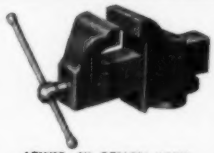

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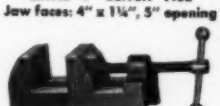

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This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 79A. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 79A.

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Chicago Flexible Shaft Co.
Johnson Gas Appliance Co.

BRASS TYPE
American Type Founders Sales Corp.

BRAYERS
American Type Founders Sales Corp.

BRAZING TORCHES
American Gas Furnace Co.
Atkins & Co., E. C.

BRISTOL BOARD
Dietzgen Co., Eugene
Post Company, Frederick
Weber Co., F.

BRITTANIA METAL
Craft Service
Metal Crafts Supply Co.
Metal Goods Corp.

BRUSHES, ARTISTS'
Dietzgen Co., Eugene
Post Company, Frederick

BRUSHES, CIRCULAR, BRISTLE AND WIRE (All Kinds)
Atlas Press Co.

BRUSH CONDITIONER
Wisconsin Laboratories, Inc.

BRUSH MAKING MATERIALS
Whiting, E. B. & A. C.

BUFFERS, BENCH, PEDESTAL
Black & Decker Mfg. Co.
Snap-On Tools, Inc.
Stanley Electric Tools

CABINET HARDWARE
Brodhead-Garrett Co.
Stanley Works

CABINETS, Cut and Electro
American Type Founders Sales Corp.
Hamilton Mfg. Co.

CABINETS, Furniture, Galleys, Ink, Type, and Rollers
American Type Founders Sales Corp.
Hamilton Mfg. Co.

CALIPERS
Starrett Co., L. S.

CARVING TOOLS for Wood and Linoleum
Brodhead-Garrett Co.
Chicago Wheel & Mfg. Co.
Craft Service
Greenlee Tool Co.

CEMENT
Casein Co. of America

CENTER LATHE
Atlas Press Co.
LeBlond Machine Tool Co.
South Bend Lathe Works

CERAMICS
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Weldon Laboratory, James W.

CHARTS
Stanley Tools
Nicholson File
Disston & Sons, Henry

CHASES
American Type Founders Sales Corp.

CHASING TOOLS
Craft Service
Metal Crafts Supply Co.

CHISELS, Cape, Cold, Grooving
Atlas Press Co.
Cincinnati Tool Co.
Disston & Sons, Inc., Henry
Millers Falls Co.
Stanley Tools

CHISELS, FRAMING, MORTISE
Greenlee Tool Co.
Millers Falls Co.
Stanley Tools

CHISELS, Metal Cutting and Wood Carving
Atlas Press Co.
Disston & Sons, Inc., Henry
Greenlee Tool Co.
Millers Falls Co.
Stanley Tools

CHUCKS, COMBINATION
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Snap-On Tools, Inc.
South Bend Lathe Works

CHUCKS, DRILL
Atlas Press Co.
South Bend Lathe Works
Walker-Turner Co., Inc.

CHUCKS, INDEPENDENT, Universal Combination
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Boice Crane Company
South Bend Lathe Works
Walker-Turner Co., Inc.

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Delta Mfg. Co.
Lewis Machine Tool Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Walker-Turner Co., Inc.
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Armstrong Bros. Tool Co.
Atkins & Co., E. C.
Cincinnati Tool Co.
Columbian Vise & Mfg. Co.
Starrett Co., L. S.

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Adjustable Clamp Co.
Cincinnati Tool Co.

CLAMPS, BAR
Adjustable Clamp Co.
Cincinnati Tool Co.
Oliver Machinery Co.

CLAMPS, CARRIAGE, SCREW
Adjustable Clamp Co.
Cincinnati Tool Co.
Columbian Vise & Mfg. Co.
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COMBINATION SQUARES
Starrett Co., L. S.

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Rouse & Co., H. B.

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CONTROLLERS, ELECTRIC
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Delta Mfg. Co.
Disston & Sons, Inc., Henry

COPING SAWS
Atkins & Co., E. C.

COPING SAWS, Power
Delta Mfg. Co.
Walker-Turner Co., Inc.

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Stanley Tools
Starrett Co., L. S.
Millers Falls Co.

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Engineering Sales Company
Post Company, Frederick
Weber Company, F.

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Delta Mfg. Co.
Do Walt Products Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Wallace & Co., J. D.

CUTTER HEADS
Atkins & Co., E. C.
Delta Mfg. Co.
Morse Twist Drill Co.
Williams & Co., J. H.

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American Type Founders Sales Corp.

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Boice Crane Company
Delta Mfg. Co.
Disston & Sons, Inc., Henry
Parks Woodworking Mach. Co.
Walker-Turner Co., Inc.

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Stanley Tools

DOWELING JIGS
Stanley Tools

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Engineering Sales Company
Post Company, Frederick

DRAFTING TABLES
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Post Company, Frederick
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Sjostrom Co., John E.
Weber Company, F.

DRAFTSMEN'S INSTRUMENTS
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DRAWING INSTRUMENT REPAIR PARTS
Dietzgen Co., Eugene
Engineering Sales Co.

DRAWING OUTFITS
Dietzgen Co., Eugene
Eng.neering Sales Corp.
Post Company, Frederick
Weber Company, F.

DRAWING PAPER IN ROLLS AND SHEETS
Dietzgen Co., Eugene
Post Company, Frederick
Weber Company, F.

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Delta Mfg. Co.
Millers Falls Co.
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Walker-Turner Co., Inc.

DRILL SHARPENERS
Atlas Press Co.

DRILL STANDS, BENCH, POST, PEDESTAL
Armstrong Bros. Tool Co.
Black & Decker Mfg. Co.
Boice Crane Company
Brodhead-Garrett Co.
Millers Falls Co.
Stanley Electric Tools

Authors with INTEGRITY INTELLIGENCE and EXPERIENCE *wrote these texts*

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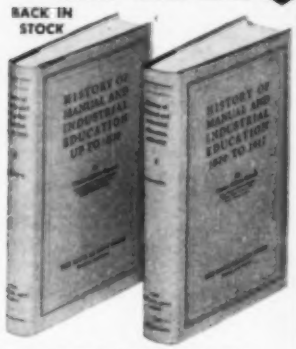

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(Continued from page 68A)

the harder they grip. Release the pressure and the jaws release, ready for another "bite." This feature gives the A-80 a *built in* ratchet action for operation in close quarters. No ratchet wrench is necessary.

Because the grip is in the exact center, the tool turns on center. This means that the 2⅜-in. face will turn in just that diameter. You can "pull" a ½-in. stud with less than 1-in. clearance between the stud and surrounding obstructions. Just ½-in. protrusion of the stud is necessary for proper operation, and no stud is too long.

Simple construction makes it easy to take apart should cleaning and oiling be necessary. Finished in cadmium.

The accompanying illustration shows the firm's display board showing the wide variety of wrenches and tools which they manufacture. They also published a new catalog which describes their tools and which can be obtained by writing for it.

For brief reference use IAVE—0302.

FRANKLIN HIDE GLUE IN TUBES

In solving the problem of making hide glue in liquid form ready for instant use, The Franklin Glue Co., Columbus, Ohio, also discovered how to eliminate offensive odors. The result is a glue just as good and just as strong as that long used by industrial craftsmen for wood joining. It is no longer necessary, however, to go through the tedious process of mixing with water, heating, and applying while still hot.

Tubes being filled with Franklin hide glue

The new Franklin hide glue tests consistently 3000 to 4000 pounds per square inch, making the joint stronger than the wood itself.

The tube machine recently installed at Franklin makes liquid hide glue available in handy tubes made of aluminum which assures continuing good quality for several years. The glue continues to be marketed also in quarter pints, half pints, quarts, and gallons. The tube cap unscrews easily when placed under a hot water faucet.

For brief reference use IAVE—0303.

(Continued on page 74A)

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NO BRUSHES REQUIRED
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A low cost, high efficiency quality Electric Glue Pot with 3 heating control —
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Write for details on its 17 advantages.

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Stanley Electric Tools
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Atlas Press Co.
Greenlee Tool Co.
Morse Twist Drill Co.
Snap-On Tools, Inc.

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Baloo Crane Company
Delta Mfg. Co.
Millers Falls Co.
Walker-Turner Co.

DRILLS, BREAST
Millers Falls Co.
Stanley Tools

DRILLS, HAND
Chicago Wheel & Mfg. Co.
Millers Falls Co.
North Brothers Mfg. Co.
Stanley Tools

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DYNOMETERS, ELECTRIC
General Electric Co.

ELECTRIC WELDING EQUIPMENT & SUPPLIES
General Electric Co.
Marquette Mfg. Co.

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Gearon Company, The
Ohmite Mfg. Co.
Reading Electric Co., Inc.

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General Electric Co.

ELECTRIC HEATING ELEMENTS
Globar Div., Carborundum Co.

ELECTRIC MOTORS
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Baloo Crane Company
General Electric Co.
Walker-Turner Co., Inc.

ELECTRIC SOLDERING IRONS
Stanley Tools

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Weston Electric Instrument Corp.

ELECTRICAL RESISTORS, FIXED CERAMIC
Globar Div., Carborundum Co.

ELECTROTYPES
Badger American Electrotype Co.

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Craft Service
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Western States Envelope Co.

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Weston Electric Instrument Corp.

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Disston & Sons, Inc., Henry
Nicholson File Co.
Plumb Inc., Fayette R.

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Hamilton Mfg. Co.
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Weber Company, F.

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Kester Solder Co.
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Millers Falls Co.
Stanley Tools

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Stanley Tools

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FORGES, GAS
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Stanley Tools

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Starrett Co., L. S.

GAUGES, MARKING
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Disston & Sons, Inc., Henry
Millers Falls Co.
Stanley Tools
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GAUGES, THICKNESS AND THREAD
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Snap-On Tools, Inc.

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Disston & Sons, Inc., Henry
Lewis Machine Tool Co.
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Atkins & Co., E. C.

HACKSAWS, POWER BLADES
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Oliver Machinery Co.
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Wallace & Co., J. D.

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Oliver Machinery Co.
Parks Woodworking Mach. Co.
Walker-Turner Co., Inc.
Wallace & Co., J. D.

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Delta Mfg. Co.

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Brodhead-Garrett Co.
General Finishes Sales & Serv.

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Carborundum Co. (Globar Div.)
Electric Hotpack Company, Inc.
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Weiden Laboratories, James

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Disston & Sons, Inc., Henry
Woodworker's Tool Works

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Lusoky, White & Coolidge, Inc.

LAMPS, MINIATURE
General Electric Co.

LATHE ATTACHMENTS
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Atlas Press Co.
South Bend Lathe Works

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American Steel Foundries (King Machine Tool Div.)
Atlas Press Co.
General Machinery & Equipment Co.
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Logan Engineering Co.
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South Bend Lathe Works

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Walker-Turner Co., Inc.

LATHES, SMALL PRECISION
Atlas Press Co.

LATHES, SPINNING
Atlas Press Co.
Baloo Crane Company
Delta Mfg. Co.
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Atlas Press Co.
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Brodhead-Garrett Co.
Delta Mfg. Co.
De Walt Products Co.
Lewis Machine Tool Co.
Oliver Machinery Co.
Walker-Turner Co., Inc.
Wallace & Co., J. D.

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Rouse Co., H. B.

LEATHER
Craft Service
Larson Co., J. C.
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Assure Easy Handling

Sterling all-steel, all-welded foundry flasks combine maximum strength with minimum weight. Solid center rib and solid sand flanges at top and bottom. Full-width bearing. In style "S" flask, pin lugs and handles are combined. When closing flask, molder can guide cope over pins by feeling pins with his fingers. In many foundries, style "S" flask has replaced snap flasks. Prevents run-outs. Requires less sand.

Write for new Catalog No. 59, describing the complete line of Sterling Foundry Equipment.

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STERLING WHEELBARROW COMPANY · MILWAUKEE 1R, WIS., U. S. A.

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CHICAGO WHEEL & MFG. CO.

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(Continued from page 72A)

BEHR-MANNING ALL-PURPOSE SANDER

Hand sanding is easy and fast with this new all-purpose sander molded of Bakelite phenolic plastic. When the sandpaper is worn out it is easily replaced by pulling back the wire clasp that releases a new length of sandpaper surface from a roll. The sander is available in five colors and two sizes, 7 by 2 in., and 5 by 1¾ in. Refill rolls are available in the various grades of sandpaper.

Behr-Manning all-purpose sander

These sanders are manufactured by Behr-Manning Corporation, P.O. Drawer 808, Troy, N. Y.

For brief reference use IAVE—0304.

BLACKHAWK'S NEW RECK-RACK EQUIPMENT

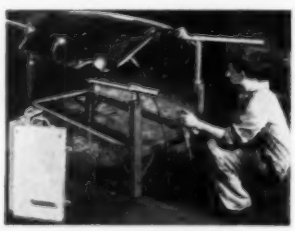
A new type of equipment for body men called Reck-Rack has been placed in the field by Blackhawk Mfg. Co., Milwaukee, Wis. It is the solution to an old handling problem now becoming increasingly more complex in body shops because hoods, doors, fenders, etc., have all become larger and more massive.

New Reck-Rack Equipment

With Reck-Rack, body men now can hold these cumbersome and unwieldy body sections more rigidly and safely for the work that has to be done on them.

Reck-Rack, because of its flexibility and versatility, is the practical and logical answer to this hand'ling problem; plus the fact that it offers such features as convenience, rigidity, compactness, portability, and accessibility.

(Continued on page 76A)



Reck-Rack equipment in use

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(Continued from page 74A)

Reck-Rack holds any size or shape of body section, in any convenient position or at any convenient height for all roughing and finishing jobs.

Blackhawk's new 8-page Reck-Rack catalog illustrates 49 applications of Reck-Rack covering, covering every type of body section, bumpers, window frames, and other miscellaneous sections. It also shows how Reck-Rack cuts setup time, how it speeds up work, and how it is used in a sequence of start-to-finish operations.

The catalog lists the following dimensions of Reck-Rack: length, 59½ in., width, 28¼ in., low height, 30¾ in., and extended height, 41¾ in. Over-all width, with adjustable arms extended to fullest length on each side, is 71½ in. Over-all length, with adjustable arms extended to maximum length on each end, is 102¾ in.

Reck-Rack will take any body section up to 71½ in. in width and 102¾ in. in length, and as small as 8 in. in width and 11 in. in length.

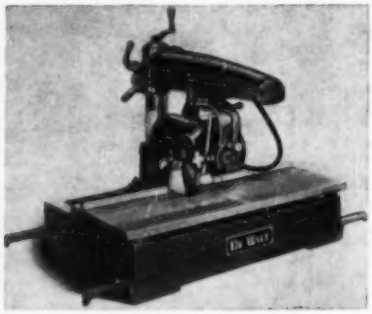
For additional information on Reck-Rack, write to Blackhawk Mfg., Co., Milwaukee 1, Wis., for their new Reck-Rack catalog No. 1042.

For brief reference use IAVE—0305.

NEW DeWALT SAW SHOP

DeWalt, Inc., 201 Martha Ave., Lancaster, Pa., manufacturers of variety woodworking machinery, announce their new low priced Model GW all-purpose machine.

Especially designed for small shops, this new model features a 1 h.p. motor driving a 10-in. diameter saw blade.



The new DeWalt saw shop

Technical improvements include a heavy-duty four-ball bearing roller travel head riding on machined tracks inside the arm, and mechanical aligning adjustments at all moving positions to maintain precision accuracy.

This new unit is a cutoff saw, a miter saw, a ripsaw, a tilting arbor saw, a double miter saw, and a variety saw.

Using the proper tool, it becomes a dado machine, a gaining machine, a grooving machine, a rabbetting machine, and a shaper.

For brief reference use IAVE—0306.

NEW STARRETT SOUND MOVIE ON PRECISION MEASURING, AND PRECISION TOOLS

"The Tools and Rules for Precision Measuring," is a 30-min., 16 mm. sound movie just released by The L. S. Starrett Co., Athol, Mass.

Presenting educational information in an instructive and entertaining manner, the film opens with a brief history of the development of precision measuring methods and standards followed by many scenes of modern applications to illustrate the basic rules and the most widely used precision measuring tools. Many new and improved tools are shown in use and instructions for reading the micrometer and vernier are presented in a new and simplified form.

The film is planned primarily for instructional use in vocational and industrial-shop classes and for training purposes before groups of shop executives and mechanics. It is also designed to give

(Continued on page 78A)

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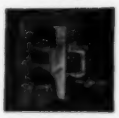

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(Continued from page 76A)

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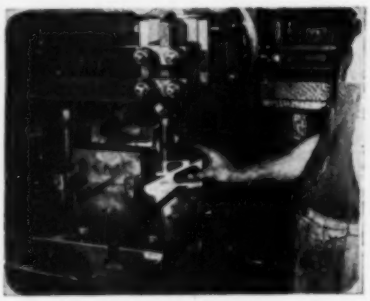

Scene from the new Starrett movie, illustrating the use of a planer and shaper gauge

This firm also has issued a new catalog and handbook of precision tools for automotive, aviation, marine, and farm equipment maintenance. The catalog section describes and illustrates the precision measuring tools used for maintenance work, and lists sizes and prices. The handbook section tells the best and most efficient ways to go about doing repair and overhaul jobs, and for using precision tools. Free copies of Precision Tools Catalog "A" are available on request.

For brief reference use IAVE—0307.

NEW STANLEY PULL-PUSH RULES

Stanley Tools, New Britain, Conn., announces new style "Pull Push" Rules, Nos. 346 and 348. Some of the features of these new rules are: Die cast "D" shaped case — add 2 in. for inside measurement; triple plated finish — chrome over nickel over copper; patented nickel plated or

New Stanley rule

white baked enamel blades; vertical marking — easier to read; quick change blade feature with positive fastening. The new Stanley rules are practical and compact to be carried in the pocket. Blades are rigid steel for measuring straight distances in any position, and flexible for circumferences, and irregular shapes. Available in 6- and 8-ft. lengths.

For brief reference use IAVE—0308.

McGRAW-HILL FILM STRIPS

On January 7 and 8, the Audio-Visual Institute of the American Museum of Natural History presented selected titles from two of six new series of 35mm. silent film strips prepared for high school and college use by the McGraw-Hill Book Co. From a total of 55 separate film strips, seven were chosen for screening before an audience of audio-visual teachers and administrators. They included the complete series of five film strips on high-school etiquette, and "Columnar Journals" and "Controlling Accounts" from the new film strips on college accounting.

The four remaining series, composed of ten film strips each, are on the subjects of chemistry, American government, zoology, and biology. These film strips are closely correlated with McGraw-Hill textbooks. The film strips average about forty frames in length.

For further information write to Text-Film Department, McGraw-Hill Book Co., Inc., 330 West 42 St., New York 18, N. Y.

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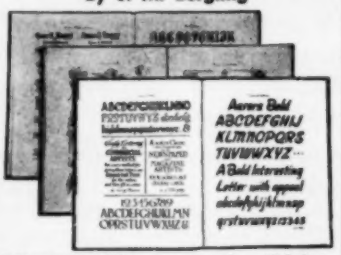

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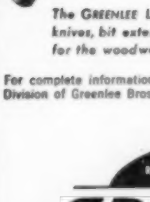

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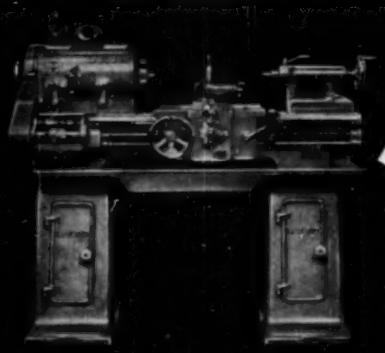

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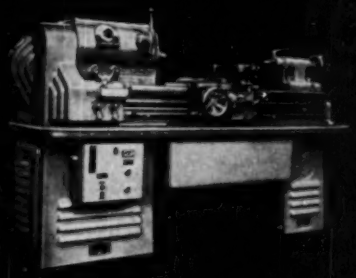

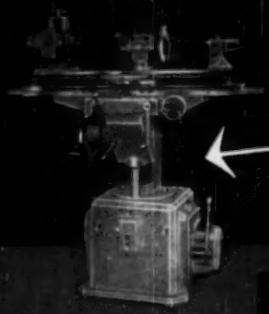

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